Emissions trading in Poland

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ENER Forum 1:

Integrating the Kyoto Mechanisms into the National Framework

Krakow, Poland, 8-9 February 2001

The European Network for Energy Economics Research
Thematic Network of the European Union Fifth Framework Programme (ENERGIE)
October 2001

The European Network for Energy Economics Research (ENER).

Thematic Network of the European Union Fifth Framework Programme (ENERGIE)

ENER Forum 1: Integrating the Kyoto Mechanisms into the National Framework, Krakow, Poland, 8-9 February 2001

Abstract
On its ENER Forum 1, held on February 8/9 in Krakow, Poland, the European Network for Energy Economics Research ENER discussed the Kyoto flexibility instruments (international emission trading IET, Joint Implementation JI, Clean Development Mechanism CDM) and their integration into the national framework of domestic policies and measures within the EU. These instruments are considered important pillars in combating climate change, supplemental to domestic policies and measures for the reduction of greenhouse gas emissions. In three parts, the ENER Bulletin 23 presents the results of the discussions:

- Part 1 focuses on project-based instruments (JI and CDM)
- Part 2 is linked to the introduction of national and EU-wide emission trading schemes
- Part 3 investigates the specific role of EU candidate countries in the introduction of the flexibility instruments

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The European Network for Energy Economics Research (ENER)

Energy policies, traditionally national preserves, have become increasingly determined in international areas, and nowhere more so than in the European Union. In view of these movements towards more international and more environmentally responsive energy policies, researchers from IEFE (Institute of Energy Economics, Bocconi University, Milan), IEPE (Institute of Energy Policy and Economics, University of Grenoble), and SPRU (Science and Technology Policy Research, University of Sussex) made a cooperation agreement in September 1985 to promote better communication among the groups and stimulate joint research activities. Since then the activities of the Network have been financially supported by the European Commission's Directorates General for Energy and for Research.

ENER has since then grown to include FhG/ISI (Fraunhofer Institute of Systems and Innovation Research, Karlsruhe) in 1988, CEEETA (Centre for the Economic Study of Energy, Transport and the Environment, Lisbon) in 1989, GIEE (Inter University Group on Energy Studies, Madrid) in 1992. In 1995, the Systems Analysis Department of Risø National Laboratory, Roskilde, the Policy Study Unit of the Netherlands Energy Research Foundation (ECN), Petten, and the Study Centre on Technology, Energy and Environment (STEM, University of Antwerpen) joined the network. Lund University, Department of Environmental and Energy System Studies became a member in 1996, the Institute of Energy Economics at the Vienna Technical University (IEW) in 1997.

With the current series of Forums the ENER Network is opening up to the accession countries with participants from Poland (Polish Foundation for Energy Efficiency FEWE Center in Krakow / University of Mining and Metallurgy UMM), Czech Republic (SRC International CS), Hungary (Energia Klub), Romania (Institute of Power Studies and Design ISPE) and to Switzerland (Centre for Energy Policy and Economics CEPE).

Preface

The objective of the Forum of the European Network for Energy Economics Research ENER is to create a debate between relevant stakeholders in academia, industry and NGOs in important fields in relation to energy, climate change and economics. It also aims at strengthening the links between national centres in energy / environment policy and economics research in particular with Eastern European countries, in view of their accession to the EU. It is hoped that the common activities with the partner institutes in those countries as well as with stakeholders participating in the events organised by ENER will contribute to continued co-operation in the same way as the one initiated among the ENER institutes in the current EU Member States one decade ago.

For this purpose, a Thematic Network was set up, financially supported by DG Research under the ENERGIE Programme. The Thematic Network coordinated by the Fraunhofer Institute for Systems and Innovation Research FhG-ISI/Germany gathers 16 institutes from EU countries, Eastern European accession countries and Switzerland which bring in their skills and experience in both qualitative and model-based analyses. Within the Thematic Network, four ENER forums are to be held, all of which in the EU accession countries, under the common theme of *Paths for Energy Policy between Policy Challenges and Market Domination*.

The current ENER Bulletin contains the proceedings of the ENER Forum 1 held in Krakow, Poland, February 2001 on the topic *Integrating the Kyoto Mechanisms into the National Framework*.

At the 3rd Conference of the Parties (COP 3) to the United Nation Framework Convention of Climate Change (UNFCCC), the "Kyoto Protocol" was agreed upon. Annex B Parties committed themselves to reduce overall greenhouse gas emissions by 5.2 % in 2008-2012, compared to 1990 levels. To meet their targets in a cost-effective way, the Protocol authorises these Parties to use flexible mechanisms such as Joint implementation, a Clean Development Mechanism and Emissions Trading, collectively termed Kyoto Mechanisms.

These mechanisms have been under international negotiation at COP 6, held at the Hague in November 2000 which ended in failure. Followed the United States' withdrawal from the Kyoto Protocol announced by President Bush in March, which meant that the entry-into-force of the Kyoto Protocol requires its ratification by a broad range of other industrialised and developing countries, including the Candidate Countries, Russia and Japan. COP 6 was resumed in July 2001 in Bonn reaching a breakthrough although substantial compromises were necessary in order to reach agreement. The 7th Conference of the Parties to the UN Framework Convention on Climate Change (COP 7) is held in Marrakech from 29 October to 9 November 2001. The objective of this conference is to translate the political agreement on the main outstanding issues concerning the implementation of the Kyoto Protocol that was reached at the resumed 6th Conference of the Parties in Bonn into legal text. The European Union has taken a major political initiative by presenting a proposal for an early ratification of the Protocol just before COP 7 (see addendum to the presentation by Mr. M. Wemaere EC on emission trading in the EU).

Principles, rules, modalities and guidelines of the flexibility instruments, which shall supplement domestic policies and measures in order to fulfil Kyoto obligations, have not been settled yet, reflecting the need for further discussion. The current ENER Forum 1 focuses on the integration of the Kyoto flexibility mechanisms into national frameworks, in particular issues relating to the interference of flexibility mechanisms with other, already existing, policy instruments in both EU and accession countries. In three sessions, aspects of project based Kyoto mechanism, of a framework for emission trading and of the perspective and role for the enlargement countries with respect to the flexibility instruments are discussed. The summary and the main conclusions from each of the three sessions are presented on the following pages.

Fraunhofer Institute for Systems and Innovation Research FhG-ISI, Karlsruhe, Germany,

October 2001

Wolfgang Eichhammer / Regina Betz

ENER Internet site:
www.eu.fhg.de/ ENER/Enerhome.htm

Abbreviations

AIJ	Activities Implemented Jointly
AOSIS	Alliance of Small Island States
B&C	Baseline and Credit (trading)
C&T	Cap and Trade
CBI	Confederation of British Industry
CCL	Climate Change Levy
CDM	Clean Development Mechanisms
CER	Certified Emission Reduction
CH_4	Methane
CHP	Combined heat and power
CO_2	Carbon dioxide
COP	Conference of the Parties
DC	Developing Countries
DETR	Now DTLR: Deportment for Transport, Local Government and the Regions, UK
DG	Directorate General (European Commission)
DTI	Department of Trade and Industry (UK)
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECCP	European Climate Change Programme
ERU	Emission Reduction Unit
ERUPT	Emission reduction units procurement tender
ET	Emission trading
ETG	Emission Trading Group (UK)
ETS	Emission Trading System
EU	European Union
GDP	Gross domestic product
GEF	Global Environment Fond
GHG	Greenhouse gas(es)
IEA	International Energy Agency
IET	International Emission Trading
IPCC	Intergovernmental Panel on Climate Change
IPPC	Integrated Pollution Prevention Control
ISPA	Instrument for Structural Policies for Pre-Accession (EU Programme which finances environment and transport projects)
JI	Joint Implementation
KP	Kyoto Protocol
MAC	Marginal Abatement Cost
MARKAL	MARKetALlocation (optimisation model used by the IEA)
NGO	Non-Government Organisation
OECD	Organisation for Economic Co-operation and Development
PHARE	EU Programme for candidate countries
RT	Relative cap Trading
SAPARD	Special Action Programme for Agriculture and Rural Development (EU Programme for candidate countries in the agricultural sector)
SME	Small and Medium sized Enterprises
SO_2	Sulphur dioxide
TEPS	Tradable Emission Permit System
UN	United Nations
UNFCCC	United Nations Framework Convention on Climate Change
UNIPEDE	Union Internationale des Producteurs et Distributeurs d'Energie Electrique
VOC	Volatile organic compound

How flexible are the Flexible Mechanisms after the Hague?

Regina Betz, Fraunhofer Institute for System and Innovations Research, FhG-ISI, Germany.

Keywords. Kyoto mechanisms, flexibility instruments, international emissions trading, Joint Implementation JI, Clean Development Mechanism CDM, Kyoto Protocol, climate change.

Abstract. Three flexibility mechanisms have been proposed under the Kyoto Protocol in order to supplement domestic action to reduce greenhouse gases:

- Under Joint Implementation, an Annex I Party invests in an emissions reduction project in another Annex I Party (e.g. transition country).
- Under the CDM, an Annex I Party invests in an emission-reduction project in a Non-Annex I Party (developing country).
- International emissions trading: trading of greenhouse gas permits among Annex I Parties.

The paper introduces the main questions linked to these flexibility mechanisms.

Introduction

A 92 page text with over 1000 square brackets formed the basis for the negotiations of the Kyoto mechanisms in the Hague. Alongside the formal negotiations of the parties in plenary, negotiations also took place behind closed doors in informal groups of varying participants. Whereas the parties involved in the formal negotiations hardly waived their positions, compromises emerged in most areas in the informal groups.

There was great disappointment on the penultimate day of negotiations when the Dutch President of the World Conference on Climate Change (COP6), Jan Pronk, revealed that work would be suspended for the time being on the negotiation texts. It would be begun again only after a consensus had been reached on the large political crunch issues. It was clear from the start that that would not occur until after the next meeting of the COP6-bis in July 2001 in Bonn. However, to a large extent, there was consensus on many issues at the close of the Climate Conference at the Hague. This paper aims to describe the compromises emerging from the present state of negotiations.

Joint Implementation (JI)

Under Joint Implementation, an Annex I Party invests in an emissions reduction project in another Annex I Party (e.g. transition country). Under the Kyoto Protocol, the credits so called emission reduction units (ERUs) can only be counted within the commitment period (2008-12).

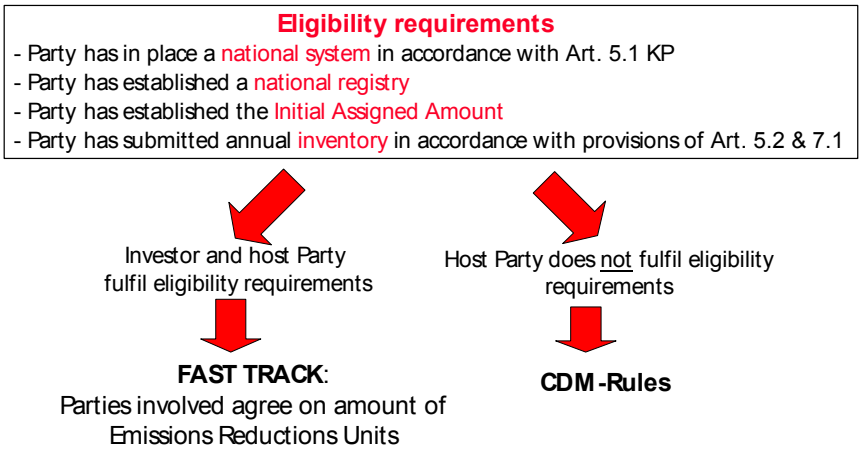

Figure 1. Two track approach JI (ISI)

At the Hague, a two track approach for joint implementation was discussed, on which there is mainly consensus: the so-called "Fast Track" represents a greatly simplified method for JI projects. The second variant ("Slow Track") applies to those states in which the host country of the JI project does not fulfil the conditions for the fast track. In order to be eligible for the fast track, all Parties involved in a project must meet the following eligibility requirements:

The Parties must have submitted a report to the Climate Secretariat and may not have received a negative response from the Compliance Committee within a certain period[1]. The report is used to prove that they

[1] The enforcement branch under the compliance committee makes a decision whether the eligibility requirements have been met or not based on the information of the review teams. The exact composition of this Committee is not yet clear.

(1) have established a national system to estimate the GHG emissions from sources and the enhancement of sinks,
(2) have a computerised national registry in accordance with the international requirements,
(3) have submitted a report to determine the initial assigned amounts,
(4) have submitted an inventory for the last year which meets the requirements of the Kyoto Protocol (Article 5.2 and 7.1) - this is probably the year 2006.[2]

In addition the parties must comply with the annual reporting requirements. Otherwise they can lose their right to use the Fast Track. In the Fast Track, the emission reductions (ERU) are negotiated between the host and the investor country, this makes a complicated baseline determination unnecessary (see below).

If the host country does not meet one of the conditions listed, then it is most likely that the same rules and project cycle will apply as for the Clean Development Mechanism (CDM).

Clean Development Mechanism (CDM)

Under the CDM, an Annex I Party invests in an emission-reduction project in a Non-Annex I Party (developing country). The emission reductions - so-called certified emission reduction (CERs) - can be gained from 2000 onwards, and will be issued retrospectively as soon as the rules have been fixed.

At the current state of debate, the same eligibility requirements as for the Fast Track of Joint Implementation (see above) apply to the Annex I Parties which have made reduction commitments under the Kyoto Protocol. Essentially, the host countries (developing countries) wanting to participate in CDM have to have ratified the Kyoto Protocol.

The following procedure is planned for the project cycle: the project participants (the investor and the organisation carrying out the project) draw up a project design document. Based on this, they apply for the "letters of approval", to have the project recognised as a CDM project by the government of the host country and the investor country. The host countries thus give their approval that the activity satisfies their sustainable development requirements. The next step is the validation of the project by an appointed "Operational Entity" (OE), which evaluates the project using the project design document with regard to the CDM criteria. OE are independent bodies which have been accredited by a panel of experts of the "Executive Board" (EB).

The EB is the central authority for CDM, which is responsible for monitoring the CDM and which is elected from representatives of the member states. The exact number of its members and their composition have not yet been agreed upon. After a project has been validated, the documents are passed on to the EB for registration - i.e. formal acceptance as a CDM project. Subsequently, monitoring takes place. This is a task of the project participants. The verification, which takes place at regular intervals, is also conducted by an OE (different to OE of validation) which checks ex-post the accuracy of the estimated CERs. The certification involves the written assurance of the OE that the project has resulted in the verified emission reductions within a certain period. The certification report actually represents an application for the issuing of emission credits to the amount of the verified emission reductions. The EB issues the CERs, unless there is an application submitted by a third party within a certain time to re-examine the CDM project. When issued, the CERs are individually marked with a serial number, the Share of Proceeds[3] is deducted and the remaining CERs credited to the account/s of the project participants.

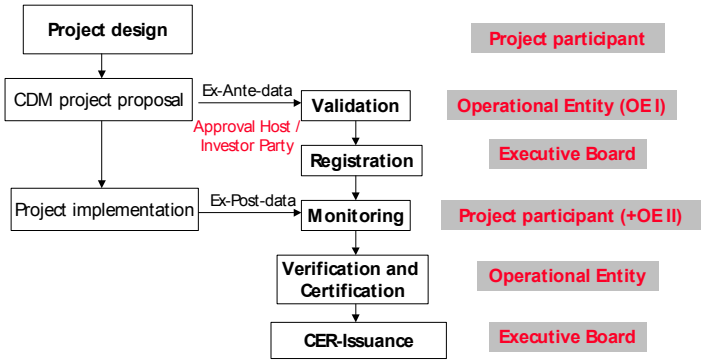

Figure 2. Project cycle (ISI)

The assumption of a **baseline** - the amount of anthropogenic emissions which would occur if the project did not take place - is of crucial significance for the amount of obtainable credits of a CDM project. The difference between the actual emissions and the baseline is used to calculate the CERs. It is becoming apparent that the baseline is set according to one of two possibilities:

a) a baseline method approved by COP/MOP, the highest committee of all parties of the Kyoto Protocols, or approved by the EB and recognised by the OE as suitable for the project and appropriately applied *or*

[2] In addition, several Parties are demanding that the Parties involved should be bound by the compliance system. The reason behind this is that Article 18 (compliance) of the Kyoto Protocol for binding sanctions provides for an amendment which would require a separate ratification (in addition to the ratification of the Kyoto protocol), in order to be binding. At present, a direct modification of the protocol is also being discussed - i.e. both would be ratified at the same time - which could, however, involve delays for the ratification. The above demand would then, however, be superfluous.

[3] The Share of Proceeds consists of a certain percentage of CERs (Pronks proposal 2%), which will be put in a fund which is managed on the account of the EB. The fund shall mainly be used to finance adaptation measures for countries most affected by climate change and, to a lesser extent, the administrative costs of the EB.

b) an alternative baseline method, provided that the COP/MOP or the EB approves the method submitted by the OE.

A reference manual is to be developed for the baseline method to further elaborate the following options for the baseline (e.g. country-specific figures for certain technologies):

(a) current or historical emissions[4],
(b) emissions of a technology which represents an economically attractive course of action taking barriers to investment into account,
(c) average emissions of such activities which were recently undertaken in Annex I Parties (i.e. industrial countries), or in host countries or an appropriate region. Closer specifications are still controversial.

It is still open whether the lowest option, i.e. the most conservative baseline should be selected, or the one judged by the project participants to be the most appropriate reference scenario. In the latter case the project participants have to have a pertinent reason.

When discussing CDM, one of the main topics is determining the **additionality** of CDM projects. The rule of additionality aims to guarantee that activities reduce emissions below those that would have occurred in the absence of the project activity so that no additional environmental pollution is caused compared to the situation without the CDM project.

In order to determine additionality, two approaches are being debated: on the one hand, achieving additionality using a strict baseline - on the other, a so-called two-stage procedure (first a strict additionality test[5] and then issuing the credits compared to a baseline which the USA believe should be more lax).

Consensus was reached in the Hague on the special promotion of **small projects**. This concerns simplifications (e.g. omitting the additionality test for renewable energies or the *assessment of environmental impact*), standardised baselines and simplified monitoring requirements for projects up to a certain size. However, the definition of these small projects is still open. Figures between 1 MW – 60 MW for fossil fuel projects and 5-75 MW for renewables are being discussed.

Furthermore, it is definite that the funds for CDM projects should be additional to current development aid and Global Environment Fund (GEF) money. It also became clear that there will be no exclusive positive list for project types to be permitted under CDM. Nuclear power projects will, however, in all probability, be excluded from CDM.

There is no consensus as yet with regard to the inclusion of **sink projects** in CDM. However, a restriction or the introduction of a procedure to resolve this issue seem likely.

International Emissions Trading

There is a large degree of consensus that Parties wanting to participate in emission trading under Article 17 should have to fulfil the same eligibility requirements as those described for the Fast Track under Joint implementation. Emission trading then functions as follows:

From 2008, Annex B Parties may sell the emission permits they do not use themselves to other Annex B Parties. The latter can use these to meet their commitments – i.e. add them to their initial assigned amount.

The system of sanctions will probably not act as a sufficient deterrent on an international level. This is due to the fact that there will most likely not be any financial sanctions in a real sense; instead the emissions exceeded are deducted from the country's future assigned amount, plus a penalty rate. Therefore, an additional system to reduce the misuse of overselling will be necessary. Otherwise, in an extreme case, a country could sell its entire initial assigned amount and then withdraw from the Kyoto Protocol or participate in the next commitment period only under the possibility of taking a lax target. The following suggestion, the so-called **Commitment Period Reserve**, is emerging as a compromise from the five options being negotiated. The following principle is involved: each committed Party determines an amount of emission rights (reserve) which it has to keep in its national register during the commitment period and may not sell. The following clarifications are based on the example of Jan Pronk's proposal of a 70% reserve.

This reserve should be the lowest of the following options, where for option b) adjustments are made based on recently obtained inventory data:

(a) 70% of the initial assigned amount,
(b) 70% of the emissions of the most recently reviewed inventory (times 5),
(c) 70% of the reviewed projected emission data, based on the last five years.

Two different cases can be distinguished (see diagram):

(1) The emissions of **Party A** are below the initial assigned amount (net sales country). It is thus allowed to sell the surplus emission permits plus the 30 %.
(2) The emissions of **Party B** are above its initial assigned amount (for options (b) and (c)). For this country, variant a) will be the lowest and the initial assigned amount minus the 70% may be sold freely under pure seller liability.

[4] This option can only be applied if the replacement of existing plants (existing sources) is involved.

[5] Threshold Approach: the project has to reach a performance level which is clearly above the average, compared with comparable activities/institutions conducted recently in the host country, in a comparable geographical region or even in an industrial country. This must be proven with the aid of a quantitatively based method approved by the EB and found to be suitable and correctly applied according to OE.

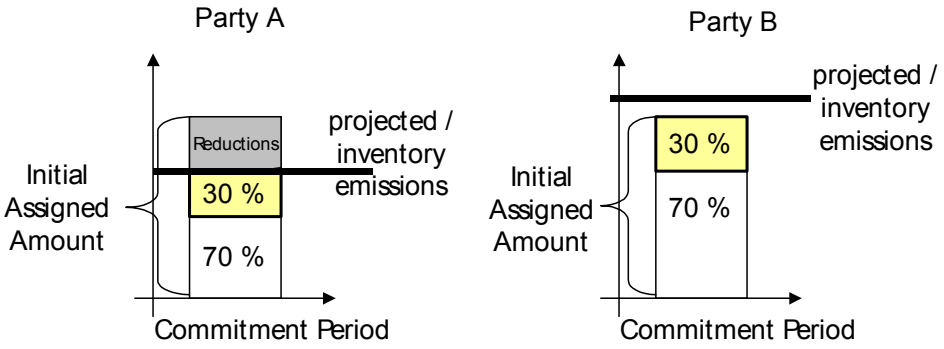

Figure 3. Commitment Period Reserve (ISI)

It is obvious that the danger of overselling is directly linked to the percentage demanded. I.e. the higher the reserve to be held, the lower the risk of overselling. The European Union therefore demands a percentage of 98 for the reserve. It wonders why countries of Type B, which would actually have to purchase net emission permits in order to meet their commitments, should also be given the opportunity to sell such a high percentage (30%) and thus take the risk of overselling. The main argument in favour of these countries being allowed to sell as well is made in the context of company participation in emission trading. Companies in country B should be given the opportunity through the sale of emission permits to procure funds to finance reduction possibilities. This may seem a reasonable argumentation at first sight, but it should be considered whether this justifies the higher risk of overselling and whether other solutions might be possible. Firstly, it could be argued that companies can sell emission permits freely within their own country and thus provide advance financing for reduction activities. Furthermore, in countries in which capital is scarce, there is still the possibility of a JI project financing. If a JI solution is not accepted, nor can buyers be found within the country, the government of such a country could purchase these emission permits, e.g. from their companies, at the international market price, since it definitely needs additional emission permits to meet its target. So that it is clear that there are other solutions available and that the reserve should be higher, e.g. at 98%, in order to reduce the risk of overselling to a minimum, especially as there are not sufficient sanctions.

Supplementarity

The Kyoto Mechanisms should be supplemental to the domestic policies and measures of Annex I Parties

According to the Kyoto Protocol, all three Kyoto mechanisms should only be additions to the domestic efforts of Annex I Parties - Parties are not allowed to completely "buy themselves out" of the necessity to pursue measures at home.

The EU has always supported a quantitative restriction, the so-called "ceiling"; however, this has been rejected by the USA and other countries. The Pronk proposal tried to offer a compromise by removing the quantitative restriction and replacing this with a qualitative obligation for each individual Party in order to prove progress at home. This is to be examined by the Compliance Committee. Whether the EU will agree to such a watering down of "supplementarity" will be revealed in Bonn in July when the negotiations are re-continued.

Session 1: Project Based Kyoto Mechanisms

Rapporteur's Summary. Jim Watson, SPRU, University of Sussex, UK

Introduction

The first session of the Forum focused on the project based Kyoto flexibility mechanisms – Joint Implementation (JI) and the Clean Development Mechanism (CDM). JI allows Annex I countries to meet some of their emissions reductions by investing in greenhouse gas abatement projects in other Annex I countries. The CDM is specifically designed to facilitate investment in abatement projects in developing countries by Annex I countries.

The session looked at these two mechanisms from a variety of different angles. *Lenka Kovarova* of the Czech Environment Ministry started with an analysis of the pilot phase of Activities Implemented Jointly (AIJ), the predecessor to JI and the CDM, by focusing on experiences in the Czech Republic. *Remko Ybema* of ECN followed this with a look at the flexibility mechanisms from the point of view of a donor country initiative – the ERUPT programme in the Netherlands. The third contribution by *Josef Janssen* from the University of St Gallen focused on the issue of risk management and explored management strategies for both donors and project hosts. *Denise Cavard* of IEPE rounded off the session with a look at the CDM, and some of the issues that will influence its future development.

The Experience so Far

Perhaps the most immediate issue that emerged from the four presentations is the uncertainty caused by the failure of the sixth Conference of the Parties (COP6) to reach an agreement in November 2000. The break-up of negotiations without final agreement has slowed down JI and CDM initiatives in some countries. For example, the second call for prospective JI projects under for the Dutch ERUPT programme has been delayed. In addition, ERUPT's CDM programme is currently on hold until the final CDM rules are agreed.

It is hoped that the resumed COP6 talks in summer 2001 will reach agreement on broad rules for both JI and the CDM. In the absence of such an agreement, many Forum participants felt it was extremely difficult to develop their approaches to JI projects in accession States to the EU.

The uncertainties are perhaps greater for the CDM than for JI. Denise Cavard highlighted different expectations of the CDM amongst developing countries. Some semi-industrialised countries (e.g. Brazil) wish to pursue projects unilaterally on their own terms whilst others (e.g. China and India) are pushing for a more bilateral approach. Smaller poorer countries tend to favour a multilateral approach since they do not have the resources to arrange financing and implementation themselves. It is clear that all of these various approaches will have to be taken into account when the final CDM rules are agreed.

Once the rules have been agreed, it will be important to draw on experiences from projects implemented under the AIJ pilot phase. Whilst the rules for JI and CDM projects are likely to differ significantly from those for AIJ, the Forum participants felt that their experiences were still relevant.

Many of the contributions about AIJ pilot projects focused on the issue of additionality. It is important to ensure that future JI and CDM projects produce additional reductions in emissions that exceed those which would have occurred without these mechanisms.

It became clear that some of the AIJ projects implemented to date have been challenged on additionality grounds. As a result, there was some debate about ways in which a non-additional projects could be excluded from the JI and CDM. Many contributors agreed that there was a balance to be struck between adequate scrutiny of projects to ensure additionality and the need to minimise transaction costs and encourage investors to come forward. As the Dutch ERUPT programme has shown, there is still work to be done to educate potential investors and host countries about the benefits of JI and CDM projects.

Issues to be Resolved

The contributions to the session highlighted many potential problems that need to be addressed for JI and the CDM to function effectively once they are established. Some of the most important of these are de-tailed below:

Setting baselines

A number of discussions of project baselines took place during the session. For each project approved under JI or the CDM, a baseline is required against which emissions reductions are measured and credits awarded.

There is considerable debate about the best method for setting baselines. Some have argued for project-specific baselines since they may be the most accurate. The drawback of this approach, particularly for small projects, is that a lot of time and effort is required to set the baseline. The investor has to make a case for the emissions reductions they aim to achieve. In addition, an independent regulatory authority must scrutinise this case to check whether it is genuine.

The alternative approach is to establish generic base-lines for each type of facility (gas-fired electric power plants, steel mills etc.). Projects that exceed this base-line in their emissions reductions will be permitted to proceed. However, this method also has problems since it may not take into account the wide variation in environmental performance in a particu-

lar industrial sector. Therefore, projects that would reduce emissions might be excluded unintentionally.

Project eligibility

A second related issue for resolution when the COP6 negotiations resume is the extent to which only certain technologies should be offered support under JI and the CDM. During the COP6 negotiations, there was considerable pressure to exclude large hydro and nuclear power plants from the CDM.

Whether or not these options are eventually excluded, decisions will need to be made by individual countries about the establishment of positive 'technology lists'. For example, during the session, it was suggested that the Czech Republic may wish to favour JI projects using renewable energy technologies. Similarly some semi-industrialised developing countries have ex-pressed a wish to draw up their own lists of favoured projects and technologies.

Distributing credits

Another issue that has not yet been resolved by negotiators is the distribution of emissions credits once JI and CDM projects are implemented. There was some debate during the session about the division of emissions credits between the host country and/or company and the donor country and/or company. It is not yet clear when the rules governing emissions credits will be established, and how much flexibility they will contain.

Managing risk

Another consideration that will be important for all parties involved in JI and CDM projects is risk management. In his presentation, Josef Janssen showed that it will be important for both investors and hosts to develop portfolios of projects to spread risk.

For potential investors considering CDM and JI projects alongside other types of investment, the Kyoto mechanisms have some added uncertainties. For example, the financial return for an investor in a JI project will depend heavily on the price of emissions credits and the actual environmental performance of the project. It was pointed out that there are large variations in the price of emissions permits and credits expected by studies that have been carried out so far. This increases the risk for potential investors. A possible solution would be for new funds to be established to invest in large portfolios of projects on behalf of groups of investors. The World Bank Prototype Carbon Fund was cited as an example of this.

AIJ projects in the Czech Republic.

Lenka Kovarova, Department of Integrated Financing, Ministry of the Environment, Czech Republic

Keywords.. Activities Implemented Jointly, Czech Republic, Joint Implementation, Kyoto mechanisms

Abstract. The paper is focused on AIJ projects in the Czech Republic. It gives an overview on approved AIJ projects, short description of projects, baseline calculation and costs of GHG reduction, and issues, which arise as barriers to move towards Joint Implementation.

Introduction

The Czech Republic is one of the parties to the Kyoto Protocol to the United Nations Framework Convention on Climate Change. As most of economies in transition, Czech Republic shall comply with the Kyoto target, which has been set at 98% according to 1989 GHG emissions, without any difficulties. Due to low abatement costs it is considered as host country for AIJ/JI projects.

Background of AIJ

Activities Implemented Jointly (AIJ) is the pilot phase of Joint Implementation (JI), one of the flexible mechanisms included in the Kyoto Protocol. Joint activities shall allow the Annex I countries to realise measures, which lead towards emission reduction, in other Annex I countries, where abatements costs are lower. The process shall ensure that GHG emission reduction will be achieved at lowest costs. During the AIJ phase there shall not be any transfer of the emission credits to the investor, AIJ serves as a pilot phase only.

It has been expected that the pilot phase will be terminated in the year 2000, but due to the strong interests of developing countries the termination has been post-pound until international rules for flexible mechanisms will be approved. The last Conference of the Parties – COP 6, which was hold in Hague in November 2000, has shown that there is lot of issues which need to be developed more.

Institutional Setting of AIJ Projects

Within the Czech Republic, the Ministry of Environment (MoE) is the responsible body to the Convention and MoE shall ensure compliance with the Protocol and participation in Kyoto mechanisms.

After the COP2 in 1996, the National Focal Point for AIJ has been established within the Foreign Relations Department and MoE published first rules for AIJ projects in April 1997. The rules were very general and except the general rules (e.g. submission of the application to the MoE, additionally, etc.), there are no specification of the approval process and of other technical issues, e.g. baselines.

In 1999 Strategy to Mitigate the Climate Change has been approved by the Ministry of the Environment of the Czech Republic. The Strategy is the first complex governmental document in the field of cli-

mate change. It sets the priorities for domestic measures to mitigate climate change as, for example, to promote energy efficiency, use of renewable energy sources, public transport, afforestation, etc. Concerning the use of Kyoto mechanisms in the Czech Republic, Kyoto mechanisms shall be considered as additional to domestic action. Within the Kyoto mechanisms, the priority is given to the project based mechanisms, i.e. joint implementation.

AIJ Projects in the Czech Republic

During the period 1996-1999 five AIJ projects were approved in the Czech Republic by MoE. They are of different types in different regions. One of projects is fuels switch, one switch to biomass heating, two industrial installations improving the energy efficiency, one on afforestation. All of them were approved by MoE individually. Detailed description of specific projects is given below (data from the Uniform Reporting Format: Activities Implemented Jointly under the Pilot Phase given by UNFCCC Secretariat).

Decin (1996, USA)

The project "City of Decin: Fuel switching for District Heating" involves fuel-switching, co-generation and efficiency improvements at the Bynov district heating plant, located in the North Bohemia. The project has converted the plant from a coal (lignite) burning facility to a natural gas-fired plant, which provides both heat and potable hot water to local apartment blocks. A co-generation facility for the production of steam and electricity has been built, and improvements have been made to the distribution network to enhance the system energy efficiency.

The foreign investors are private companies from United States. The total costs of the project are about 8 mill. USD, the AIJ component is 7.5% investment in the form of soft loan from US private companies (600,000 USD).

The facility became operational in September 1996. For the baseline calculation GHG emissions from old plant are used, i.e. it is based on coal burning. The GHGs reduction has been achieved on-site as a result of the fuel switch from coal to gas and energy efficiency improvements, and off-site as a result of electricity production from co-generation, which will reduce the electricity consumption from national grid.

Achieved GHG emissions reduction is based on difference between baseline scenario and projected scenario. The annual GHGs reduction is about 24,000 tons of CO_2, which is about 607,150 t of CO_2 during the lifetime of the project. The unit costs of CO_2 reduction is 13 USD per ton in the whole project or 2.1 USD for AIJ component only.

FACE (1997, The Netherlands)

The project "Forest rehabilitation in Krkonose and Sumava national Parks" includes afforestation of 14,000 hectares in two national parks – Krkonose in north-east Bohemia (9,000 ha) and Sumava in south-west Bohemia (5,000 ha).

The foreign investor of the project is the FACE foundation from The Netherlands. The total costs are about 60.5 mill. USD, AIJ component covered by FACE is about 80% (48 mill. USD). FACE funds the planting of forests and their maintenance for the first three years.

The CO_2 emissions reduction is calculated by the dynamic computation model CO2FIX, which has been developed by the Dutch Institute for Forestry and Nature Research. Sequestration of CO_2 is projected at about 734,000 t per year in lifetime of 99 years. The unit cost was estimated at about 1 USD per ton of CO_2 in the whole life time, URF[6] shows the cost till the year 2008 and it is about 6 USD per ton of CO_2.

Cizkovice[7] (1997, France)

The project "Modernisation of the Cizkovice Cement Factory" is realised in private company Lafarge Czech Republic, when the Lafarge Group is making all the investment in its own daughter company. The aim of the project is to improve energy efficiency.

The emission reduction is estimated at about 33,600 tonnes of per ton of CO_2 per year. Total investment is 31.9 mil. USD, investment into emissions reduction about 6 mill. USD, which represents 35 USD per ton of CO_2.

Hostetin

The "Hostetin Biomass Heating Project" is a demonstration project for use of wood chips and solar panel for domestic heating in the village Hostetin, which is located in east Moravia in White Carpatian region. It includes the installation of 600 kW biomass burner (wood-chips), construction of district heating system for 68 houses in the village, installation of solar panels (about four) and establishment of an information centre for biomass energy and other renewable energy sources.

The calculation of baseline is primarily based on the consumption of coal and brown coal used in local households heating. Also the methane (CH_4) emissions from biological degrading processes of wood, CO_2 emissions from electricity production in power plant and transport of the fuel (coal) is incorporated.

The net GHGs emission reduction is achieved by the fuel substitution, energy efficiency improvement (in some houses). The achieved emission reduction is lower by the CO_2 emissions of transport of biomass (the transport of biomass is realised from shorted distances than coal). The total emission reduction is estimated on 3,350 t CO_2 eq. per year, of which about 1,910 (60%) are CH_4 emissions avoided from wood biological degrading. In the 15 years lifetime of the project it represents about 50,250 t CO_2 eqv.

The project was put into operation in autumn 2000. Total costs of the project are 860,000 USD, the AIJ component covered by the government of The Neth-

[6] Uniform Reporting Format

[7] Data from Karlik, Hlobil (2000)

erlands is 470,000 USD. Foreign contribution represents installation of the Dutch biomass burner, training of local employees and establishing of the information centre. The emissions reduction costs are about 17 USD per ton of CO_2 eq., in the case only AIJ component is used, than it is about 9 USD per ton of CO_2 eq.

Skoda (1999, Germany)

The project "Co-generation station SKODA plant Mlada Boleslav" includes modernisation and renovation of a combined heat and power generation in the private company Skoda. The project is located in the middle Bohemia.

An old co-generation plant using lignite and gas with low efficiency was replaced by a new co-generation plant using hard coal and gas with higher efficiency (coal fired boiler – 93%, gas fired boiler – 94%). Project it provides heat for Skoda plant ant the town Mlada Boleslav and electricity for Skoda plant.

The project is realised by the SKO-ENERGO, a Czech-German consortium. The project is fully financed from private sources of Sko-energo and Skoda, the total costs are about 110 mill. USD mainly covered by the commercial loan.

The calculation of the baseline CO_2 is based on the comparison of fuel switch, improved energy efficiency and it includes also lower consumption of electricity from the grid caused by the increased production of electricity in co-generation. The annual amount of CO_2 emissions reduction is about 272,000 tons, which is about 5.4 mill. ton of CO_2 during the 20 years of lifetime of the plant. The unit costs are estimated on about 20 USD per ton of CO_2.

Weak points

The approval process of above-mentioned projects was based on very general rules, similar wit the first come - first serve principle. There are many issues, which led to difficulties in current days:

- although all of projects are approved as AIJ projects, i.e. no emission transfer, some of investors plan to negotiate credit sharing,
- due to lack of capacity within MoE, projects are not assessed by the host country,
- there are no baseline methodologies,
- types of projects vary from municipal to pure private sector, from renewable energy use to improvement of energy efficiency in industrial sector.

New AIJ rules

Due to the unsolved issues, mainly no approval process, new rules for AIJ projects have been developed in the Czech Republic. The aim of prepared rules is to serve as a basis for future JI projects, when emission credits will be transferred to the host country. The main rules include following:

1. project will lead to decrease in GHG emissions by at least 10% in comparison with the baseline;
2. the project must not lead to transferring of pollution between the individual components of the environment (air - water - soil);
3. priority areas for AIJ Projects:
   - Utilization of renewable energy sources,
   - Thermal savings in heating of buildings (insulation, regulation) in the public sector,
   - Thermal savings in heating of apartment buildings (insulation, regulation),
   - Utilization of waste industrial heat in existing installations,
   - Construction of collection systems for landfill gases in old landfills and use of energy thereof,
   - Gasification of public transport,
   - Afforestation.
   - Other installations leading to substantial decrease in GHG emissions shall also be eligible.
4. applicant must provide the evidence of financial sources;
5. the submitted project must include the following information according:
   a) transparent calculation of the reduction of GHG emissions
   b) economic effectiveness of the project
   c) other environmental effects;
6. other criteria will also be assessed: additionality, compliance with the priorities of the State Environmental Policy, "best available technology", know-how and new technologies, employment;
7. no transfer of emission credits to the investor country.

The Czech Republic has the capacity to host joint projects, but to ensure future compliance with the e Kyoto target, quantitative limitation for flexible mechanisms was set at 10 Mt of CO_2 eq. till 2008, the amount is based on estimates of future GHGs emissions. So the total emission reduction of the approved projects shall no exceed approximately 750 kt of CO_2 eq. annually.

In order to ensure transparency of the process, the National Reference Centre (NRC) has been established within the Ministry of Environment in order to administrate the processes and the Expert Committee for AIJ Projects Evaluation in order to select projects for approval. Unfortunately, human resources are still limited.

Joint Implementation projects

JI mechanism is considered as a source of available financing for support of energy efficiency improvement and of renewable energy sources in the Czech Republic. Although current AIJ rules bind the process of project approval, there are many crucial issues not solved.

1. Orientation of JI projects: shall JI mechanism be used for all varieties of projects or shall the support be focused on support of not very profitable

projects, e.g. use of renewable energy sources or municipal sector only. Shall private sector be included, if the project is realised in a daughter branch of foreign investor? Than domestic investors doing the same measure would not be "awarded" by emission credits.

2. Additionality: the issue of additionality is not much tackled yet. Is the project additional, if it is realised only to fulfil legislation in host country?
3. Baseline estimation: shall the baseline calculation be done on project to project base or specific methodologies for specific types shall be approved (it would decrease the transaction costs of the project). For example, NGOs advised to use gas baseline for projects on renewable energy use[8].
4. Verification: who approves project, incl. baseline. Who pays the verification.
5. Credit sharing: shall credits be transferred for the whole lifetime of the project or for 5 years only (2008-2012). How to calculate credit sharing, according to share of investment? How estimate if JI part of investment in not a grant but loan.
6. Price of the credit: Shall the price of the credit be fully depended on actual project costs or shall the investor country set a minimum price? How to ensure not to sell "low-hanging-fruits" and at the same time to ensure economic efficiency of projects.

Future orientation

In the light of latest development at COP6 in Hague, it should be considered that if the procedures of JI and CDM will be similar, JI projects will be discouraged due to high transaction costs. Although JI projects shall be given priority against emission trading due to theirs direct environmental benefit achieved by real measures taken, the economic efficiency, based on low transaction costs, favours emissions trading.

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[8] Karlik, Hlobil (2000)

How to integrate JI and CDM in national climate policy - the example of the Netherlands.

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Keywords. Climate policy, Joint Implementation, emission targets, emission projection.

Abstract. The Netherlands has implemented a substantial part of its climate policy to achieve its Kyoto target. Both domestic measures and actions abroad are part of it. After a brief introduction to Dutch domestic climate policy, this paper focuses on one part of the Dutch climate policy: ERUPT, which is the Joint Implementation programme. The characteristics are introduced and some early experiences are given. Insights are also shared on new emission projections for the Netherlands and the consequences this may have.

Introduction

In confronting climate change, domestic policy makers are faced with a complex environmental problem that has implications for the economy and society at large. The long time frames related to climate change, and the uncertainty surrounding possible futures, present a particular dilemma to politicians and policy makers. In Kyoto in 1997, signatories of the UN Framework Convention on Climate Change negotiated legally binding targets for Annex I countries to reduce emissions in 2008-2012. The Kyoto Protocol provides flexibility to Parties to achieve some portion of the required emission reductions beyond their own borders through the use of a variety of innovative economic instruments: Joint Implementation (Article 6), Clean Development Mechanism (Article 12) and emission trading (Article 17). They are expected to significantly enhance the cost-effectiveness of greenhouse gas limitation policies.

In addition the Protocol allows Parties to work together to collectively share the formalised agreements among themselves. Accordingly, the EU has reached agreement on internal burden sharing. For the Netherlands this has resulted in a –6% emission target.

Domestic policy makers have to find a balance what part of their obligation will be met with domestic policies and what part abroad. The Netherlands Government searched for such a balance and has developed two Climate Policy Implementation Plans that contain the climate policy initiatives. The first and second Implementation Plans deal respectively with domestic actions and actions abroad.

The present paper gives an introduction on the Dutch climate policy programme. The main elements of the domestic measures and the policy for actions abroad are covered. Special attention is given to the Dutch JI programme that was launched in May 2000 and to recent developments relevant to domestic actions and actions abroad. The paper concludes with a preliminary evaluation of the Dutch climate policy programme and recommendations.

Balance between domestic action and emission reduction abroad

The emission target for the Netherlands is generally perceived to be difficult to achieve. Therefore the Dutch government aims to achieve a substantial part of emission reduction abroad. The EU position in the climate negotiations is that countries should make no more than 50% of their total effort outside their own borders. In the Implementation Plan the Dutch Cabinet starts from the supposition that 50% of the total policy shortfall, should be achieved with domestic measures. Part I of the Dutch Climate Policy Implementation Plan deals with these domestic measures. The share to be achieved with measures outside the Netherlands is covered in Part II, which was issued in summer 2000.

Domestic actions

The rational of the Dutch is that climate policy must not cost society more than is necessary. In selecting the measures to be taken in the Netherlands attention was therefore devoted primarily to cost effectiveness. A second criterion was the distribution of the effort across the various greenhouse gases. CO_2 emissions are the core of the problem. Therefore a balance was sought between measures that contribute to deflecting the trend in the growth of CO_2 emissions and measures that reduce large amounts of emissions of the non-CO_2 greenhouse gases relatively inexpensively. In order to generate commitment for the measures within society, as balanced as possible a distribution across target groups was also sought (Ministry of VROM, 1999).

Table 1: Distribution reductions across sectors

sector	reduction in 2010 in Mtons CO_2-eq.
Industry (including refineries)	10.0
Energy companies	8.0
Agriculture	2.0
Traffic	3.0
Households	2.3
Trade, services, government	1.0

The domestic measures selected have been divided into three packages. The basic package contains measures which can be taken now and which offer a reasonable degree of certainty. These measures should be good for a total reduction of 25 Mtons CO_2-equivalent per year compared to the baseline scenario (see Table 1). In putting together the national policy, a reserve package was also formed in addition to the basic package. The reserve package contains measures that will be prepared and that can be taken if things go different than expected during the run-up to the 2008-2012 period. Policies may be less successful than is currently assumed, or external circumstances may turn out less favourably than expected. The reserve package gives an added edge of certainty that the commitment to reduce emissions will actually be met. Finally, a third package of measures has been adopted, containing initiatives intended to lead to innovation. It is expected that further reductions of greenhouse gas emissions will be needed after 2008-2012. The innovation package contains steps that the Netherlands will take to prepare for that situation. Innovation for long-term emission reduction by means of transitions is the central theme for the new environmental policy plan to be issued in the course of 2001.

Actions abroad

In Part II of the Climate Policy Implementation Plan (issued mid 2000) emphasis is given to the two project-based flexible instruments JI and CDM. Emission trading is also considered as a prospective instrument but priority is given to JI and CDM. Although the precise rules for the use of and participation in, the flexible mechanisms remain to be decided, the main elements are becoming clear. For this reason and to gain early experience, the Netherlands is willing to be one of the first countries active in JI and CDM. Its strategy for both JI and CDM is to seek a balance between national programmes and multinational programmes, e.g. via the World Bank or regional development banks. For JI the Netherlands is participating in the Prototype Carbon Fund of the World Bank and the Netherlands has started ERUPT, the first real JI programme. The CDM programme is currently under development. A CDM unit at the Ministry of Environment is expected to be operational from the first of April 2001.

Design of Dutch JI program ERUPT

The purpose of ERUPT (Emission reduction units procurement tender) is to obtain the ERUs from countries in Central and Eastern Europe. The Netherlands is probably the first investor country with a real JI programme. The program has been named ERUPT and falls under the Dutch Ministry of Economic Affairs. They want it to be environmentally credible and attractive for businesses. To achieve this the experiences from the Dutch Activities Implemented Jointly (AIJ) programme. These AIJ insights cover among others the following:

- JI is a complex instrument that requires involvement of many actors;
- It takes efforts to get projects started;
- Investors perceive many risks;
- It takes efforts to get projects approved by host countries;
- Realising a Letter of Intent takes long;
- Transaction costs are significant. Therefore, a JI program should primarily aim at larger projects;

The first tender of ERUPT was opened between May and July 2000. The following description of ERUPT applies to the characteristics of this first tender. For the design of ERUPT the challenge was to meet the following requirements:

- The program needs to be attractive for investing industries;

- The projects in the program need to lead to credible emission reduction;
- The program should lead to the purchase of ERUs at a price that is competitive to realising emission reduction within the Netherlands;
- The program should be in accordance with EU regulation.

The host countries must be willing to approve transfer of ERUs claims to The Netherlands. The governments of Bulgaria, Romania and Slovakia have signed Memoranda of Understanding in which they support JI transactions with the Netherlands to facilitate approval of transfer of ERUs.

ERUPT aims at larger projects. The size of offers to the first tender of ERUPT should at least be the equivalent of 0.5 Mton CO_2. ERUPT could only be an interesting option for smaller-scale ventures if they have an umbrella project management. Depending on the specific type of investment, the sale of claims on ERUs could enable between 10 and 40 percent of a JI project's funding requirement to be secured.

ERUPT aims to be a transparent programme for which the different steps that have to be taken are in accordance with the way a project developer views a project cycle.

ERUPT is run as a public tender in accordance with standard EU procurement formats. This implies that suppliers are invited during the prescribed tender periods to submit their offers to a body experienced in running programmes (Senter Internationaal), for assessment against two criteria: (i) price per ERU, and (ii) feasibility. ERUPT consists of two phases, a selection phase and a contract awarding phase. In the selection phase those submitting tenders can submit an Expression of Interest form to the tendering authority. Companies that have expressed their interest are screened, assessed by means of a set of selection criteria and ranked.

In the project selection phase project developers must show they are financially able to deliver claims and have the proper technical capacity.

Contracting (Phase II), delivery of claims by the project developer and the consequent transfer of ERU's shall take place as described by the following procedure:

1. The project is approved by the host country as a JI project. Project approval is laid down in a Letter of Approval by the host country;
2. Next, if the proposal is accepted by the tendering authority, the ERUPT-contract between the tendering authority and project developer arranges the approval of the project by The Netherlands and sets the legal base for the financial transactions between the tendering authority and the supplier;
3. ERUs become official once certified during the commitment period;

Based on the Letter of Approval and the ERUPT contract, the Netherlands can exercise the claims, and transfer of ERUs from the host country to the Netherlands will take place. The host country and the Netherlands will jointly report the transfer to the UNFCCC Secretariat.

Before submitting an offer, a project's baseline study must be validated by an *independent verification organisation*. This organisation must work according to the *Operational Guidelines for validation and verification of baselines and emission reductions*. This can be any validation organisation already working in the field of validation and certification.

Contracts will be awarded on the basis of economic attractiveness. Then, the following shall be taken into consideration:

1. Price;
2. Technical feasibility;
3. Financial basis;
4. Project organisation (so that the ERU's can be delivered during the commitment period);
5. Absence of significant negative environmental or social effects;
6. Economic stability of the recipient country

No formal price limit applies to Claims on ERUs. Senter Internationaal has estimated that the market price for a Claim on ERUs will come in the 4.5 € to 9 € range. Although the delivery of claims on ERUs will be deferred until the commitment period (2008-2012), Senter Internationaal will proceed with prepayment with effect from the date of contracting. In view of milestones as are reached in the course of investment implementation, up to 80 percent of the contract price could be disbursed in advance.

Activities supporting ERUPT

The Dutch Ministry of Economic Affairs realised that to make ERUPT successful, it would require additional actions. The main supporting activities are given here.

MoUs with host countries

The Dutch Governments has signed Memoranda of Understanding (MoUs) with host countries. In these agreements host countries agree to put aside a certain amount of emission reduction that can be transferred to the Dutch Government as a framework for JI projects. The MoUs contain obligations for the Netherlands with respect to capacity building.

Capacity building

Capacity building comprises support of the institutional set-up and staff of a JI unit, support in the development of procedures and decision-making, transfer of knowledge and training in Joint Implementation and ERUPT. The Netherlands Government has started projects for capacity building in Bulgaria and Romania. The longer-term perspective to secure the continuity of capacity building is also covered. The secondary objective of the assignment is therefore to contribute to a sustainable capacity in Bulgaria and

Romania in the field of Joint Implementation and climate change.

It is the intention of the Ministry of Economic Affairs to support initial capacity building activities for a limited time period. On a longer term other donor countries are envisaged to make use of the same unit. To achieve this it is important to have a sustainable unit that has a base of broad support within the host country.

Operational guidelines for baseline studies

Operational guidelines for baseline studies, validation, monitoring and verification have also been developed by request of the Ministry of Economic Affairs. A key requirement is that the emission reduction[9] from the project is real, measurable and long-term. In order to determine the impact on greenhouse gas reduction so-called 'baseline studies' and monitoring reports are required. The baseline study estimates the emissions in absence of the project and compares it with the emissions related to the implementation of the project. They should therefore be used as a tool to estimate the anticipated emission reductions. Monitoring reports are required when the project is in operation to check if the emission reduction took place.

The set of guidelines was developed by Det Norske Veritas and ECN and reviewed by an international expert panel. It provides operational guidelines and background information on the development of baseline studies and monitoring reports for Joint Implementation (JI) projects under the first tender of the ERUPT.[10] The guidelines aim to provide guidance applicable to all kinds of JI projects. The guidelines provide a 11 clear steps that need to be considered in the design of a baseline study. The guidelines opt for baselines that will not be modified before the first crediting period as long as the project is not modified.

Other support

Several other supporting activities were organised. This included workshops for project developers aiming to explain the structure and procedure of ERUPT and to give practical instructions how to set up a baseline study. Workshops for validators were also organised to train them in the validation of baseline studies. The Dutch Government has accepted various validators. The validators have to compete for validation and monitoring activities.

Another kind of support was a limited financial transfer to project developers to lower transaction cost associated with baseline studies and validation.

Early experiences with ERUPT

The experience with ERUPT so far is satisfying. Twenty-six Expressions of Interest were received for JI projects in Phase I of the first ERUPT tender. This covered a range of countries in Eastern Europe that included MoU countries as well as countries that have not signed a MoU with the Netherlands. About half the project developers is from the Netherlands, the other half is from other Western European countries.

From these 26 projects 9 were selected for the second phase. This selection includes cogeneration (district heating), wind energy, hydropower, biomass, reforestation and landfill gas extraction. The contract value of the nine projects totals € 72 million on a total investment volume of almost € 500 million. As claimed in the Expressions of Interest, the CO_2 emission reduction amounts to 9 Mton for the first budget period, or 1.8 Mton per year. If this claimed emission reduction will be supported by the baseline study and validated, the average price would amount to 8 €/ERU. This price is at the higher end of the estimated price range. The host countries for the projects include Romania, Poland and the Czech Republic

By February 15 2001 these project developers have to submit detailed project design documents, a validated baseline and a Letter of Approval from the host country. Senter expects the first contracts to be signed by April 2001.

Recent developments in climate policy and emission projections

At CoP-6 Parties failed to reach an agreement on the rules and guideline for the mechanisms. This failure has consequences for the Dutch JI and CDM activities. Before CoP-6 the second tender of ERUPT was scheduled for early 2001. A consequence of the failure of CoP-6 in The Hague is that the second tender is postponed. If CoP-6 Part II will be able to nail down details on the flexible mechanisms, the second tender of ERUPT may start after the summer of 2001. For CDM, the Dutch have the intention to start ERUPT-CDM before the summer of 2001 if preparations to set up the programme go smoothly.

The first evaluation moment for the Dutch climate policy is early 2002. Therefore information will be collected in the course of 2001 on the success of policy measures and emission projections with the related uncertainties.

Early evidence from energy statistics shows that despite high economic growth, emissions have grown less than the latest set of scenarios projected. The main reason is that the economic structure has changed more rapidly than expected. Other causes are the implemented energy conservation instruments and the increased import of electricity. Recent emission projections confirm this: CO_2 emissions for 2010 are expected to be about 23 less than emissions from the scenario that was used to as policy reference (see Figure 1).

[9] It should be noted that in these guidelines the term emission reduction also covers sequestration and sink enhancement projects.

[10] The first tender of ERUPT was open between May 15 and July 17, 2000 for expressions of interest.

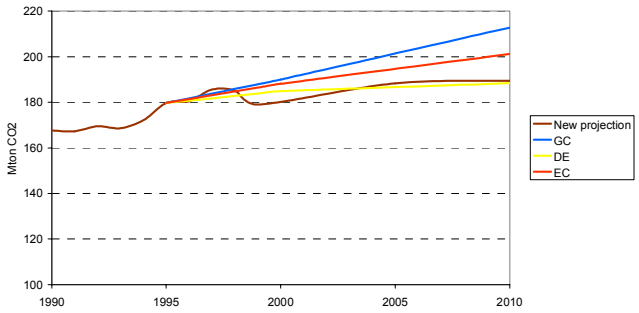

Figure. 1. CO_2 emission projections: new projection and earlier scenarios (GC, EC and DE) (Ybema et al, 2001)

Conclusions

There are many ways to integrate CDM and JI in a national climate policy. The Netherlands has taken its own decisions. With the experience gained so far it can be concluded that:

- The Netherlands is at the forefront in implementing climate policy;
- A balance should be aimed at between domestic measures and measures abroad;
- The experience with ERUPT so far indicates that a pragmatic approach works. It is recommended to built and refine JI and CDM programmes on experience gained
- Future JI and CDM activities of the Dutch Government will depend on the outcome of CoP-6 Part II, GHG emission trends for the Netherlands and the relative success of other JI and CDM tenders.

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Risk Management of Investments in Joint Implementation Projects.[11]

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Keywords. Joint Implementation projects, international emissions trading, flexibility instruments, Kyoto Protocol, climate change

Abstract. The Kyoto flexibility instruments, in particular Joint implementation (JI) and Clean Development Mechanism (CDM) have underlying risks which need adequate risk management strategies. After having discussed the main difference between International Emissions Trading (IET) and Joint Implementation (both involve exchange of emission permits among Annex 1 countries to the Kyoto Protocol), the paper points out the main risk components, mainly associated to the quantity of emission credits, the price of emission permits, the costs in period t, the uncertainty in the discount rate and in project (crediting) lifetime. Risks can be diminished by the strategy of portfolio diversification, in particular by suitable blends between JI and CDM projects through carbon funds or Kyoto funds. Another issue to consider is the commercial insurance associated to the Kyoto flexibility instruments. The discussion of these risk strategies shows that a variety of research questions are still in an earlier stage and need to be further clarified by R&D projects and pilot projects.

Introduction

What I want to do today is to share with you a few thoughts on risk management of investments in JI projects, and I will do this in the following order. First of all, talking about Joint Implementation (JI) we need to have some common understanding what we mean by JI, and I will try to put forward some thoughts on the nature of JI. Talking about risk management we need to identify what are the risks. Next, after having identified the risks, we can think about managing or hedging those risks, and one option is to diversify risks through carbon funds or Kyoto funds, and I will explain the basic idea behind that. A classical risk management instrument is commercial insurance by insurance companies. I will also put forward some thoughts on this tool before I conclude.

Nature of Joint Implementation JI

We all know the Kyoto mechanisms of the Kyoto Protocol encompass three mechanisms: (i) Joint Implementation JI, that are basically projects in Annex 1 countries and transfer of resulting emission permits or so-called ERUs to another Annex 1 country. (ii) CDM projects, i.e. climate protection projects in non-Annex 1 countries, and resulting emission permit transfer again to Annex 1 countries. (iii) International emissions trading that is basically international transfer of emission permits again among Annex 1 countries.

[11] Transcription of the oral presentation by J. Janssen.

Kyoto Mechanisms in the Protocol

✔Joint Implementation - JI (Art. 6)
- climate protection projects **in Annex I countries**
- international transfer of resulting emission permits (ERUs) **to Annex I countries**

?Difference?

✔Clean Development Mechanism - CDM (Art. 12)
- climate protection projects **in non-Annex I countries**
- international transfer of resulting emission permits (CERs) **to Annex I countries**

✔International Emissions Trading - IET (Art. 17)
- international transfer of emission permits (PAA/AAUs) **between Annex I countries**

➨ **Important implications for risk structure**

What strikes one at the first glance is that there are two instruments for the international transfer of emission permits among Annex 1 countries. What is the difference between these two instruments? Several criteria have been proposed to distinguish JI and International emissions trading. One criteria relates to trading between governments versus legal entities, the private sector or companies. It has been argued that international emissions trading is only for governments. Consequently, if the companies want to have an international transfer of emission permits, they need to refer to JI. This is one idea for distinguishing the two instruments, though it is not my opinion. It is just a criteria.

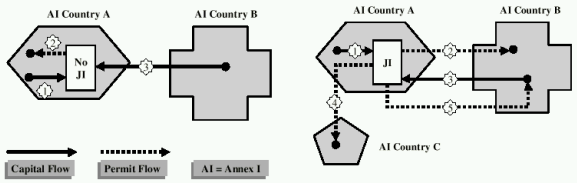
Distinguishing JI and IET: Possible Criteria (I)

✔Trading between
- governments versus **IET (?)**
- legal entities **JI (?)**

✔Production of emission permits involves **JI (?)**
- international (equity capital) investments
- no international (equity capital) investments **IET (?)**

Another criterion is that the production of emission permits might or might not involve international investments. It has been argued that for JI projects some international investments are needed. Otherwise they would not qualify as JI. Consequently, if there is no international investment we would have some kind of international emissions trading. I would argue it is not a necessary condition to have international investments in JI projects. To illustrate this: if we have a foreign investor investing in Poland for example, and subsequently emission permits would be transferred to another entity in Poland, this would not be an JI project. So international investments are not a distinguishing feature of JI. What is necessary is that we have international transfer of emission permits irrespective if we have international investments or not. For example a Polish company investing in an emission protection project in Poland and subsequently transferring emission permit to Switzerland, that would be a perfect JI project.

Are International Investments a Necessary Attribute of JI Projects?



Another criteria, which is very convincing:

We have different trading systems in general. In the literature we find the cap-and-trade system (a very prominent example is the US SO_2 trading system and we will hear later on the European proposal, and also the Cap-and-Allowances trading system in Denmark and in the UK. In the UK they have a mixture of both systems). Cap-and-allowances is basically that we define a cap, a maximum limit of emissions for a group and then that cap is allocated to single participants who have to stick to that cap. The cap is defined in terms of absolute emissions. A second system is the baseline-and-credit system. International emission trading and JI can be characterised by the type of underlying trading system.

Distinguishing JI and IET: Possible Criteria (II)

✔Transfers out of
- a cap-and-trade system vers **IET (?)**
- baseline-and-credit system **JI (?)**

➨ **Important implications for risk structure of underlying project investment**

In summary the Kyoto flexibility mechanisms, including the CDM, might be characterised according to the following list of criteria:

Assumption: Characterising the Kyoto Mechanisms

	Legal entity participation	International investments	Baseline-and-credit	Cap-and-trade
JI	Yes	Possible	Yes	No
IET	Yes	Possible	No	Yes
CDM	Yes	Possible / required	Yes	No

JI

➨ **here: only JI, but considerations also applicable to CDM and IET**

Risks of Investments in JI Projects

Why is it relevant to carry out risk management for JI projects?

- JI investors are first of all interested in attractive risk return profiles of the project.

- Second, realisation of potential welfare gains involved with JI projects takes place only if investment risks are low enough.
- Third, efficient and effective global mitigation policy requires availability of risk management tools.

The risk management process takes place along the following lines:

- Determining objectives of risk management
- Identifying risks
- Evaluating risks
- Selecting risk treatment devices
- Implementing the decision
- Evaluating and reviewing

The basic starting point for the risk analysis of JI Projects is given by the following formula for the investment value, the components of which will be discussed in the following.

Risk Analysis of JI Projects: Investment Value Starting Point

$$NPV = \sum_{t=0}^{T} \frac{R_t - C_t}{(1+r)^t}$$

NPV	=	net present value
R_t	=	revenue in period t
C_t	=	costs in period t
r	=	discount rate of future cash flows
T	=	lifetime of the project

The revenue can be further decomposed into the price of the permit and the quantity of emission permits generated by the JI (or CDM) project.

Revenue: Basic Risk Components

$$R_t = p_t \bullet y_t$$

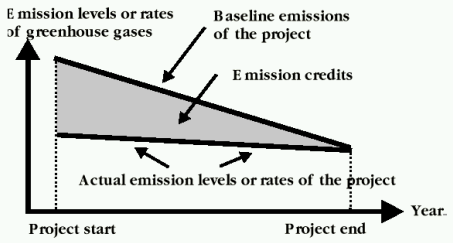
R_t	=	revenue of the JI/CDM project
p_t	=	price of emission permits
y_t	=	quantity of emission permits generated by the JI/CDM project

Risk Component: Quantity of Emission Credits

Determining the Quantity of Emission Credits is based on the following definitions:

- JI involves: "reductions in emissions...that are additional to any that would otherwise occur".
- CDM involves: "reductions in emissions that are additional to any that would occur in the absence of the ... project activity".
- Both statements are based on the issue of environmental additionality (which includes the baseline issue).

Quantity of Emission Credits Generated by JI/CDM Projects



Just to bring it to your mind again: there is the baseline and the actual project emissions and the difference are the emission credits or permits we have generated. Now, several methods are discussed in the international debate, how to determine baselines. Without entering details, there are on the one hand project-specific baselines, and they apply to a concrete single project, and we have multi-project baselines which apply to multiple project types. In this case one tries to standardise emission levels or rates or intensities or procedures for defining baselines. There is some excellent service by the OECD on baseline determination for your further information.

Approaches for Baseline Determination (I)

✔Project-specific baselines
- baseline applies to one project only
- project-specific assumptions, comparisons, estimates or simulations for all key parameters

✔Multi-project baselines
- defined and applied to multiple projects of similar type
- aim to standardise emission levels or rates/intensities

Another distinction that is relevant is that we could define baselines in absolute emission levels (e.g. the baseline of a project could just be 100 t CO_2 per year). or we could define baselines in terms of emission rates or intensities, relative to the product output of the project (x tonnes of CO_2 per kWh or per tonne of cement produced). Both approaches are valid. We do not have any decision so far on which approach should prevail, but they have fundamentally different implications. This aspect has been neglected in the international debate which has focussed rather on the technical details. Another aspect of baselines is that they might be adjusted during the lifetime of projects.

Approaches for Baseline Determination (II)

- ✔Baseline definition in terms of
  - absolute emission levels
  - emission rates or intensities relative to the projects product output, e.g. tons of CO2 emissions per kWh
  - important implications concerning risk factor "product output" (see below)
- ✔Will rules and guidelines be adopted at COP6bis?
- ✔ Baselines might need to be adjusted during lifetime

Just to have a more thorough understanding of the quantity of emission permits in the case of baselines defined as emission rates: The quantity is basically the difference between our baseline emission standard and our actual emission rate multiplied with the product output. If we actually manage to be below the baseline and if we increase product output we will also have an increase of emission permits generated by the project. That is the danger of intensities. Finally, at the aggregate level, we could end up with being below our baselines but we will not reach our target because the production of the product has increased so much . That is also a major concern of the European Union about the negotiate agreements with industry, because industry wants to have emission rates but there is no certainty that with intensities we will reach our Kyoto target.

Uncertain Quantity of Emission Permits with Emission Rates

$$y_t = \left(\bar{e}_t^R - e_t^R\right) \cdot x_t \,, \qquad \frac{\partial y_t}{\partial x_t} > 0$$

$\bar{e}_t^R$ = baseline emissions in terms of rates
➨ affected by uncertain rules

e_t^R = project emission rates
➨ affected by technological risks

x_t = product output to which the baseline and project emission rates refer
➨ affected by uncertain market conditions

If we look at the other case were we have baselines in terms of levels: obviously actual emissions of the project again depend on our product output and on actual emission rates. This is a different formula and it has completely different implications. If we produce more of a product then, at the same time, we will have a reduction in emission permits generated (see the sign of the first derivative which is negative in this case). And here we have different risk factors, for example the product output cannot be controlled necessarily; it depends on the demand on the market. The actual emission rate is effected by technological risks. Baseline emissions are affected by political risks in terms of rules for baseline determination.

Uncertain Quantity of Emission Permits with Emission Levels

$$y_t = \bar{e}_t^L - e_t^L\left(x_t, e_t^R\right), \qquad \frac{\partial y_t}{\partial x_t} < 0$$

$\bar{e}^L$ = baseline emissions in terms of levels
➨ affected by uncertain rules

e_t^L = project emission levels

e_t^R = project emission rates
➨ affected by technological risks

x_t = product output
➨ affected by uncertain market conditions

With non-CO_2 emissions, additional risks are added with respect to the quantity of emissions:

Uncertain Quantity of Emission Permits with non-CO2 GHG

- ✔Uncertain conversion rates (GWP)!
- ✔Current internationally agreed rates:

GHG	GWP for 100 years time horizon
Carbon dioxide (CO2)	1
Methane (CH4)	21
Nitrous oxide (N2O)	310
Sulphur hexafluoride (SF6)	23 900
Perfluorocarbons (PFCs)	6 500 – 9 200
Hydrofluorocarbons (HFCs)	140 – 11 700

Risk Component: Price of Emission Permits

So far a few thoughts about risks related to the quantities of our project. The other component of revenue is price. There are some price projections as listed below for a few models. There you see huge uncertainties in terms of future prices. Which price will I get for my permits? I do not know! Everybody is telling another story. But just to have a rough idea, a guidance, we could try to take the average, which is 8 US$ per tonne of CO_2 . The average is not always a good indicator. If we have a very wide dispersion in our estimates we might want to have an idea what is the median. The median is 7 US$ per tonne of CO_2 which is quite close to the average. There are already some transactions in the revert (e.g. in New York, London and Oslo). The (forward) price they get now for permission permits to be delivered in 2010 (i.e. not a spot price) is around 1.25 to 2.5 US$ per tonne of CO_2 . The World Bank Prototype Carbon Fund is aiming at a price of 5.5 US$/tonne CO_2 . BP had an internal trading scheme, and so far prices revealed by the internal trading scheme is around 20 US$/tonne CO_2 , but they are very hopeful that prices will go down further.

Uncertain Market Prices for GHG Emission Permits

Model	Permit Price (1998 US$/ton CO_2)	
	Global trade = unrestricted CDM	JI and IET only
AIM	12	21
ECN	4	5
EPPA	8	44
G-Cubed	7	18
GEM-E3	8	16
GRAPE	13	22
GREEN	7	18
MS-MRT	10	29
POLES	6	17
RICE-98	5	18
Average	*8*	*21*
Median	*7*	*18*

Transactions in real world:

- Natsource: 1,25 to 2,5 US$
- ERUPT: 4,2 to 8,4 US$
- PCF: 5,5 US$
- BP: 20 US$

Risk Component: Costs in Period t

On the cost side basic risk components of the permits stem from the fact that:

- abatement or mitigation costs are uncertain
- transaction costs are uncertain, e.g. due to
  - Baseline determination
  - Project approval
  - Project verification and certification
  - Adaptation and administration levy on CDM (and JI?) projects
  - Brokerage fees
  - etc.

Risk Component: Discount Rate

Next component is the discount rate; we need to discount our cash flows. There is a formula to calculate your discount rate which you should apply as a company (based on the capital asset pricing model). There are some components in it which all will change during time.

Uncertain Discount Rate

$$r_i = r_f + \beta_i (r_m - r_f)$$

r_i = expected return of I investment
r_f = rate of return on a risk-free asset
r_m = expected return on the market portfolio consisting of all risky assets
β_i = beta of the I investment, with

$$\beta_i = \frac{\mathrm{cov}(r_i, r_m)}{o^2(r_m)}$$

Risk Component: Project lifetime

The next component is the T, i.e. the time horizon or the duration of the project. This is the issue of the crediting lifetime of JI projects. The crediting lifetime is the time during which the project can generate emission credits. This is still an open question. Rules are not yet decided. What is very probable from the perspective of an investor is that a country will not approve a baseline beyond 2012, because it does not know what would be the commitment by that time. It would be foolish for the host country to approve a baseline after 2012.

Uncertain Crediting Lifetime of JI Projects

- ✔ Crediting lifetime of JI projects is the length of time emission credits can accrue
- ✔ Rules and guidelines still need to be decided
- ✔ Crediting lifetime of JI projects might be limited to 5 years (2008-2012) due to the fact that not limitation and reductions commitments agreed for second etc. commitment period

Risk Diversification through Kyoto Funds

How can we manage those risks? One standard approach in managing risks of assets in finance is risk diversification. That relies on the fact that the risk of a portfolio of several more risky assets is reduced compared to the risk of one individual asset.

Risk Management Strategies

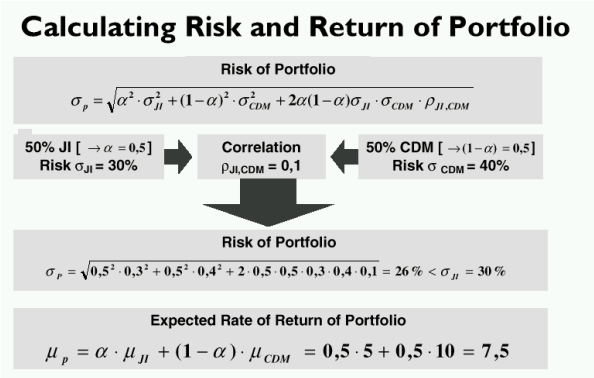
- ✔ Risk control
  - risk avoidance
  - risk reduction
    - loss prevention (self-protection)
    - loss control (loss protection, self-insurance)
- ✔ Risk financing
  - risk transfer
  - risk retention

That is statistical fact used in finance. It occurs if the risks of the different individual assets are not perfectly correlated with each other.

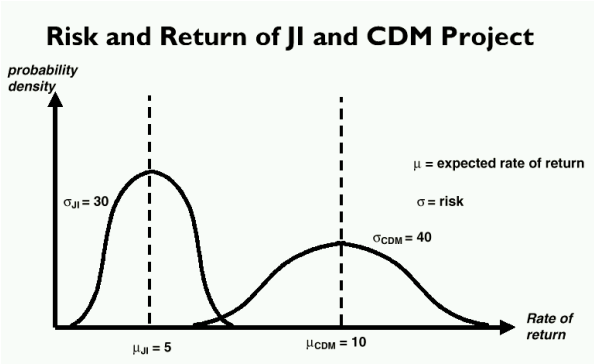
Risk Diversification

- ✔ Diversification: overall risk of project portfolio less than sum of the risks of individual projects
- ✔ Occurs if individual risks are not perfectly positively correlated
- ✔ Here: include those projects in your portfolio the risks of which have low or negative correlation
- ✔ Underlying principle of carbon funds / Kyoto funds

What are the implications or the recommendations from this? If you want to build up a portfolio of different projects, put those projects in your portfolio which have a negative or a weak positive risk correlation. This is a basic underlying principle of carbon funds or Kyoto funds. Below is the formula for calculating the risk, which is a standard statistical formula



Just to have a visual idea of its implication. Lets consider a JI project that has an expected return of 5. The project has some risk, and we are not sure that the project really gets a return of 5. This risk can be depicted by some probability density function. The risk can be measured by the variance or in equivalent terms by the standard deviation. And lets say this is 30 in our case. If we have then another project, a CDM project, here our expected return is 10, i.e. higher than in the previous case, but we have also a higher risk. For an investor it is difficult to say, which project to choose.



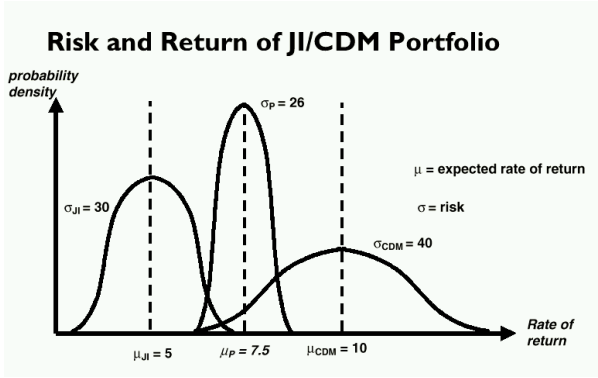
But we have some criteria for the decision (some of which are quite weak):

Criteria for Evaluating Risk and Return

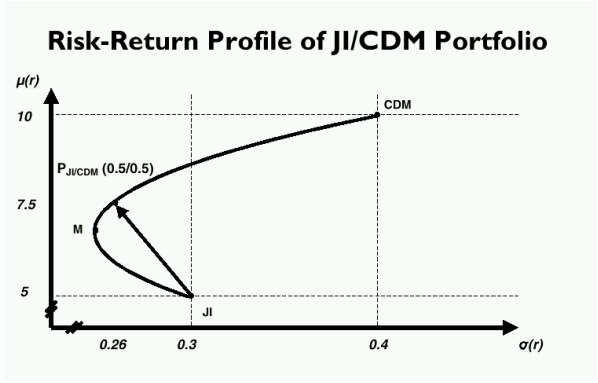
✔Fundamental criteria (Markowitz)
- at given risk, investor prefers higher return
- at given return, investor prefers lower risk

✔Inefficient investment: there is another project that has
- higher return at given risk, or
- lower risk at given return

In the case of our two projects, if we combine them in a portfolio, we end up with the following risk return profile: Higher return than our investment in the JI project only, and the risk is lower. So it is good not to invest all our money in the JI project, but also to invest some of our money in the CDM project. Here, the assumption is that we actually have half of our money in the JI project and half in the CDM project.



We could actually try not just to invest 50%/50% but could combine other ratios for the investment. We would get the following curve which describes the combination of all possible portfolios between those two projects. If your are familiar with finance this called an efficiency frontier. All projects with are left to the JI project are better than just the JI project alone. In all these cases we increase the return without increasing the risk.



We could achieve such diversification through investments in funds which would invest in different projects. In return the fund would get the emission permits, and the permits could be distributed to the individual investors on a pro rata basis. Alternatively the fund could direct emission permits into the market, get the cash return and distribute the cash return to investors. (This is useful only if the fund wants to diversify price risks. Otherwise there is no benefit in selling permits on the market).

There are already some Kyoto funds initiatives:

- WB Prototype Carbon Fund
- EBRD-Dexia
- Credit Lyonnais (private sector bank)
- UBS (Switzerland)
- etc.

Diversifiability of JI Investment Risks

	different project types: technologies	different project types: products	different project types: baselines as rates or levels	different project types: JI versus CDM	different host countries
quantity risks					
* technological risks	yes				yes
* product output		yes	yes		yes
price risks					
cost risks					
* abatement costs	yes				yes
* project approval	yes			yes	yes
* adaptation levy	?			yes	?

Commercial Insurance

Commercial insurance is another strategy to handle risks. We all know an insurance contract is described by a an insurance premium. We need to pay and in return we get a compensation, if a specific event causes a loss. In the context of JI projects we have different causes that can generate a loss, e.g. we could have technological under-performance, or baseline adjustments, and so on.

Commercial Insurance

- ✔ Insurance contract described by
  - premium paid by the insured
  - compensation which the insured receives if specific events cause loss
- ✔ Causes of loss in the context of JI/CDM, e.g.
  - technological under-performance
  - baseline adjustments to ongoing projects
  - higher abatement and transaction costs
  - lower prices, etc.

Not all risk are insurable. Insurance companies will not be prepared or willing to insure all risks. They need to meet certain criteria:

Insurability of Risks

- ✔ Basic requirement: Large number of independent and identically distributed risks
- ✔ Losses occur with a high degree of randomness
- ✔ Maximum possible loss is very limited
- ✔ Average loss amount upon loss occurrence is small
- ✔ Insurance premium is acceptable for seller / buyer
- ✔ Hardly any possibility of moral hazard

In the context of Kyoto mechanisms projects we would envisage to have an extension of some existing coverages. There are business interruption insurance for consequential loss (e.g. if a machinery breaks down, for some months we get a compensation of resulting losses because we cannot produce a product, products cannot be sold, we cannot produce emission credits, emission credits cannot be sold etc...). This is an easy extension of existing insurance schemes. We have already some technology performance insurance that could also be extended in order to cover losses associated with the non-production of emission permits. Further fire insurance (for sink projects) or political risk insurance could also be extended. Or we could have some new kind of risk insurance, e.g. for counterparty risk or for liability insurance. Some companies are already developing insurance schemes, for example Swiss Re, has finalised a feasibility study. They consider to go ahead and to develop new insurance schemes.

Insurance of Kyoto Mechanisms' Projects

- ✔ Extension of existing coverages
  - Business interruption insurance for consequential loss
  - Technology performance insurance
  - Fire insurance (sink projects)
  - Political risk insurance
- ✔ Design of new insurance schemes e.g. for counterparty risks?

Outlook

A variety of the questions mentioned in this contribution as being open questions will be further investigated by an R&D project co-financed by the European Commission under the lead of IWO. Here are ist main features:

- German insurance company; Italian bank; British/US-American emissions broker; IWO (lead).
- Development of insurance schemes for Kyoto Mechanisms: insurability of risks; optimal design of insurance contracts; insurance and risk premiums.
- Development of a Kyoto fund, based on quantitative analysis of efficient risk diversification.
- Project finance and Kyoto Mechanism.
- Case studies.

Participation of DCs in climate change prevention: CDM and beyond.[12]

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Keywords. Climate change, Flexibility mechanism, Clean development mechanism, Joint implementation, Additionality, Developing countries

Abstract. An agreement on CDM rules is important both for industrialised and developing countries. As a flexibility mechanism, it will allow industrialised countries to benefit from low cost emission reductions but the CDM, as a main goal, should also stimulate a more sustainable economic development in DCs.

The CDM is the sole instrument, with GEF, proposed for DCs participation into climate change prevention. This situation satisfies a majority of DCs, but CDM may not offer sufficient perspectives for some countries with rapid industrialisation given the huge economic stakes linked to the creation of a carbon credits market between Annex I countries.

The operationality of the CDM is not yet established and important questions, as environmental additionality, are still unresolved. Here we first examine the rules in order to validate project additionality and their possible consequences on the effectiveness and the scope of the mechanism. The different reaction of major DCs groups on the structure of the mechanism will then be analysed. This will lead us to examine the possibilities to enlarge participation of DCs in climate change prevention according to the apparent wish of countries with rapid industrialisation.

Introduction

The CDM was created as the result of interest conflict between industrialised and developing countries. The former, bearing historical main responsibility for the increase in greenhouse gas concentrations, committed themselves not only to limit their emissions, but also to facilitate the transfer of climate-friendly technology and to provide developing countries with "new and additional financial resources". The latter gave priority to their development needs; their involvement in the prevention of climatic risk depends principally on the transfers of technology and finance from the richest countries.

At Kyoto, the question of strengthening Annex I countries commitments brought the debate on the North/South joint implementation back onto the agenda. Some Annex I countries only accepted higher reduction targets on condition that they could resort to flexibility measures, especially the North/South flexibility. Joint implementation is not explicitly mentioned in the Kyoto Protocol but the concept, unchanged, has been implemented among Annex I countries (East/West) and less clearly between developed and developing countries in the CDM. However, a fundamental new dimension is introduced, as the CDM should also "assist Parties not included in Annex I in achieving sustainable development" (PK, Art 12-2).

The CDM is potentially more than just a flexibility mechanism and, unlike joint implementation, it has awakened real expectations from developing countries. By favouring investment projects more clearly seen as development priorities in host countries, it could lead to new investment flows and speed up the transfer of technology and know-how. It introduces the possibility of effectively integrating developing countries into the general climatic risk prevention effort, while respecting their need to develop further. Nevertheless, it poses basically the same problems as those encountered by joint implementation (Dixon, 1999): without rigorous checks on additionality of projects and the actuality of associated reductions, the creation of the CDM could undermine the aim of the Convention, namely the stabilisation of greenhouse gas concentrations. Although eastern countries have quantified commitments and developing countries have not, the rules and methods to apply would be very similar, with the exception of projects being implemented bilaterally, directly between the investor and the host country, as it has been suggested for small projects, in a "fast track" approach.

Most of the DCs can find in the CDM a way to satisfy their needs. But other ones wish to play a more active role in reducing emissions and also in participating in the technology market and commercial flows linked to carbon credit market. They fear, if the CDM framework is too strict, of being excluded from new economic and industrial opportunities; and, consequently, they fear for their social and economic development. For them it is necessary to enlarge the CDM rules, and to examine different options for a better participation in overall climate-friendly actions and mechanisms.

A legitimate need for environmental additionality

Annex I countries consider North/South flexibility to be essential because it allows access to emission reductions at a lower cost. It is however potentially dangerous in terms of the Convention's ultimate aim, as it introduces the possibility of credits being produced in countries without any binding quantitative commitments. Without the application of control checks for quantified emissions targets, there is nothing to prevent the sale of "fictitious" credits and large-scale production of "tropical hot air"[14] in non-

[12] A extended version of this paper may be find on IEPE internet site :

http://www.upmf-grenoble.fr/iepe

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[14] "Tropical hot air" is the term usually applied by the negotiators to describe the production of fictitious emission

Annex I countries. It is therefore essential for the activities undertaken in the context of the CDM to bring about additional emission reductions, that is, reductions that would not have occurred had the incentive provided by the CDM not been there.

Two major methodological approaches have been proposed in an effort to resolve this question. The first consists in analysing the projects on a case by case basis, while the second uses a more standardised process based on the definition of reference practices

The project-by-project approach: more rigorous but much more expensive

Measuring the additionality of a CDM activity is based on the need to know what would happen if no additional income from the sale of credits in the CDM was available. Would another project have been implemented, or would the environment-friendly project have been realised in any case?

The economic analysis allows this question to be answered. It can thus be assumed that an economically profitable project without emission credit valuation would probably be implemented without any consideration for global environment. On the other hand, if the same project costs the investor more than a reference option less favourable to the environment, it would only be implemented if the value of the carbon credits allows the additional cost to be offset.

In this kind of additionality approach, for each project a specific baseline is defined and the CDM activity is evaluated in comparison with it. The aim is to limit as far as possible the «windfall» effects that could result from setting up the CDM. For some, this method is the only one that truly allows the environmental additionality of CDM activities to be guaranteed and to guard against mass production of fictitious credits in DCs.

The pilot phase of Activities Implemented Jointly[15] has however shown that constructing baselines has in some cases proved particularly difficult (Beuermann et alii, 2000; Dixon, 1999). Moreover, this additionality approach, based on economic profitability, is not necessarily consistent with the investors' real decision-making processes that include also subjective aspects. Projects that appear profitable on paper are sometimes not realised, while others, initially less attractive, will be implemented without taking account of carbon credits. In these conditions, it is impossible to assess the additionality of a project using only its economic profitability as a basis.

The additionality of an investment must also be assessed in a context of "asymmetry of information", which leaves investors free to manipulate certain parameters in their favour. One of the regulatory bodies of the pilot phase, the Joint Implementation Registration Centre in the Netherlands, acknowledged once its task was completed that economic criteria "can be manipulated quite easily and will always be met by creative bookkeeping", and that it was therefore difficult to answer the question "does the investment go beyond the investments that would be made otherwise?" (JIRC, 2000). In consequence, this additionality approach has the major inconvenience, from the investor's viewpoint, of being partly unforeseeable.

The need for the investor to draw up a specific reference situation, and the need for the regulator to analyse the relevance and genuineness of information supplied for each individual project, make this method relatively expensive. The more rigorous and precise the checking and validation of the emission credits, the higher the cost, and therefore the higher the risk of increased transaction costs for each project.

The risk that the size of the CDM will be limited through investors being put off by the excessive complexity of the project validation procedures has led to other means of monitoring environmental additionality being introduced.

Standardised approaches: simplicity versus strictness?

The use of technology lists is the first means by which additionality can be standardised and simplified (Hargrave et alii, 1998). Additional technologies are defined *a priori* according to the country or the socio-economic context. These technology lists could be revised periodically to take account of changes noted such as dissemination of certain types of technology or the advent of new options, and could lead to the creation of technological matrices with a temporal aspect.

The practice of "benchmarking", an alternative to the above approach, is based on the same logic of standardisation. Reference or standard figures are produced for the environmental efficiency criteria of a sector: for example, carbon content per kWh for the electricity sector or per tonne of cement for cement works[16]. Every project that produces an emission level below the limit must be considered to be additional, regardless of the technology used. "Benchmarks" have an advantage over technological matrices because there is no need to identify all the additional technologies beforehand.

In both cases, the main idea is to lay down references beforehand for use as pointers in quickly assessing the additionality of proposals submitted to the regulator and their impact in terms of emissions. It is not necessary any longer to carry out an *ex ante* in-depth study of each project. So, the project approval procedure will become at once more predictable and less expensive, and thus meet the wishes of investors for a simpler and more transparent system In addi-

reductions in developing countries because of the implementation of non-additional projects.

[15] In the pilot phase, we say "Activities Implemented Jointly" and not "joint implementation", in order to indicate that the projects thus realised cannot lead to the granting of emission credits.

[16] This type of indicator also poses a reference problem. What should be considered: the average for the equipment installed, the upper tenth, the most efficient equipment, or the most recent installation?

tion, these approaches lend themselves to a dynamic application based on periodic redefinition of reference thresholds, taking account of technological progress.

Although less accurate than the project-by-project additionality analysis, the standardised approach provides much more of an incentive for potential investors, and we can suppose that it would be required for small projects producing only a limited amount of emission credits.

On the other hand, for large projects, a case-by-case approach may be justified initially, despite its limits, with the expectation that the benefit of experience will lead to the standardised approach being refined and thus effectively limiting non-additional projects.

What will be the environmental efficiency for the CDM?

Behind the debate on CDM project additionality assessment procedures is a broader one on geographical flexibility and on the involvement of developing countries in global warming prevention. This debate opposes supporters of a strict definition for additionality and those in favour of a more dynamic approach to the CDM.

It is in fact essential to be equipped with means of assessing additionality in order to prevent the large-scale production of fictitious emission reductions from frustrating the aims of the Convention. There is however a risk that laying down excessively complex rules in an anxiety to create a legitimate level of strictness, will dissuade potential investors from participating in the CDM and ultimately limit its size. The relevance of the CDM is not confined to more flexibility for Annex I countries; it is also aimed at favouring and accelerating cleaner and more efficient technology adoption in developing countries.

Some people believe that it would be beneficial to accept a limited percentage of non-additional projects if the CDM were capable of boosting investment in DCs, in a more environment-friendly way. Without losing sight of the need to guarantee project additionality, the validation procedure should be simplified so as to favour the instrument's status as an incentive; the CDM would benefit from greater investment and therefore a net increase in emission credits, despite a simultaneous increase in the proportion of non-additional projects. In dynamic terms, the spillover effect produced by enlarged dissemination would also benefit the global environment. The proposals aimed at developing the sectoral or programme-based approach in the context of the CDM point in this direction (cf. infra).

The CDM would become a means of aiding development and allowing benefiting from short term advantages of flexibility. But the main goal would become thus, from the dynamic viewpoint, to steering the DCs towards sustainable development paths by facilitating the adoption of cleaner and more efficient technologies.

Different expectations and strategies among developing countries

After COP4, the negotiations around the "Buenos Aires Plan" let know the positions and preferences of developing countries, which are a general agreement on some points, but also sharply differing expectations of what the CDM should bring to developing countries.

The first point of agreement is that the CDM cannot be limited to North/South joint implementation. Its role is more fundamental: while allowing developing countries to participate in the overall fight against global warming, it must also contribute to the economic and social development of these countries. DCs also believe that CDM activities should be undertaken with respect for their national sovereignty and national development priorities, and that host countries should adopt a proactive role with regard to project eligibility and monitoring and credit availability;

In other respects, the differences between countries are great, especially in matter of equity, eligible activities and initiatives taken by national actors. The sharp differences expressed in the area of project financing and how the CDM should work, reveal very different perceptions of the CDM and its potential effect on the countries in question. In the negotiations on the implementation of CDM, three possible basic approaches[17] for organising the mechanism have appeared: a bilateral approach, a multilateral one and an unilateral one. These different approaches may be combined to produce a mixed model, combining the advantages inherent in certain models. It has been suggested that the bilateral and unilateral approaches could be combined so as to profit from both the efficiency of the former and the fairness of the latter. The unilateral approach would necessarily be associated with one of the two others.

The preferences expressed for one or another method of organising the CDM[18] are clearly affected by the economic properties of the countries in question, but also by their political relationships. It will be noticed that these choices and preferences are never expressed in absolute terms, but depend on how the climate-related negotiations unfold. We present the positions of three groups of countries as they seem typical of DCs' perceptions and preferences.

China and India in favour of a strictly bilateral approach

For these two countries, CDM projects must work in a strict bilateral relation between an Annex I country investor and a non-Annex I country, so as to assess better the scope and implementation of the projects and limit outside influences on national development

[17] For a more comprehensive treatment of the approaches, see Yamin, 1998; and Baumert, 2000.

[18] This analysis relies on the official contributions (about the CDM) from the non-Annex I Parties to the climate-related negotiations.

options. In addition, they wish to restrict the use of credits produced in favour of the investor country alone. The emission credit should not be transferable or exchanged on markets. In a strict bilateral relation it is easier to justify such a restriction.

This position is indicative more of opposition in principle to North/South flexibility than of fear of not being able to control the resultant investment flows. For India and China, a very rigid CDM of limited size would not be a problem to them, as their economic size and level of development have made them very attractive for a number of large-scale projects. They are already attracting a significant proportion of private investment[19] and also receiving the most ODA. Their arguments as to the specific role of this mechanism are largely rhetorical or political, and aimed at other developing countries and the G77 and China.

AOSIS[20], the African countries, and some Central and South American countries: a multilateral approach aimed at better allocating the benefits of the CDM

The countries preferring to choose the multilateral approach make up a group of territories of modest economic and geographical size; most of them are vulnerable to climatic change. They consider that they are often marginalized by purely market-based instruments, being not attractive enough for obtaining projects. These fears have been increased by what happened during the AIJ pilot phase, during which the African countries and small island states were granted only a tiny number of projects (Menanteau, 1997).

Of these countries, the smallest and poorest do not have the means to organise the financing of projects or to implement them independently. A centralised multilateral finance arrangement would have the advantage of directing the funds and projects more fairly from a geographical point of view, without excluding the least developed countries. In addition, dissociating supply of and demand for projects would have the effect of limiting the dependence on businesses and on the Northern States. Finally, because of their limited power of negotiation, the smaller countries are hoping to obtain more advantageous certified emission reduction prices and a more favourable distribution of profits.

Most Central and South American countries, and South Korea, for a unilateral approach

The countries wishing for a unilateral approach to the CDM are all semi-industrialised countries of average economic size, which have their own clean technology or are capable of implementing it. Some of them, like Costa Rica, Mexico, Brazil, have demonstrated yet their capacity to select and implement projects and to organise financing.

Several arguments have been put forward in favour of unilateral implementation; most notably, greater consistency with national development priorities, a willingness to develop domestic greenhouse gas mitigation programmes, and South/South co-operation initiatives. However, the main argument in favour of unilateral approach is that these countries also wish to benefit from the income obtained from the sale of credits by completing projects in their own territory or in other developing countries. In fact, these semi-industrialised countries do not wish to remain removed from the new industrial and business potential opened by the creation of the CDM. They are fearful that their industrial development will be hampered if the Annex I countries are the only ones to profit from the technological push that could be help for by the CDM.

The expectations implicit in these various positions suggest that some countries would like to exceed the limits laid down by the CDM and play a larger and more active part in the prevention of climatic changes. In this way the first two groups, namely China and India on one hand and the least advanced or poorest countries on the other, are strictly within the context of the CDM. The first group thinks that it will benefit from project flexibility in every way, the essence of things being that the industrialised countries make the greatest domestic effort. The second group wishes to benefit from the CDM, and with that in mind is making proposals aimed at adjusting the market's spontaneous tendencies. With regard to the countries in the third group, it seems essential for the rules of the CDM to be widened in order for them to benefit. They are therefore clearly advocating more active participation by the developing countries, within the bounds of the mechanism and possibly beyond.

What are the perspectives for developing countries beyond CDM?

Currently, the only way of including developing countries in the international global warming prevention strategy is the CDM, which imposes certain limits linked to the project-based flexibility approach.

The first limit has been mentioned above as an introduction to the debate on project additionality validation procedures. In the absence of quantified commitments by the host countries, nothing can prevent anyone from strategic manipulation of baselines except strict validation of additionality procedures.

The second limit relates to the amount of credits likely to arise through project flexibility. Some emission reduction potentials are in fact difficult to mobilise in the context of projects (energy management in households, for example), and require the implementation of specific programmes, measures and policies.

[19] Within the DCs, China is the commonest destination of foreign direct investment, with 30,4% of the total in 1997. India is the tenth. China is the main beneficiary of ODA ; India is the third. (Baumert et Kete, 2000).

[20] The AOSIS (Alliance of Small Island States) is a coalition of 42 small island countries whose survival is threatened by climate change. It is very much involved in climate-negotiations.

Finally, the opposition of developing countries to project-based flexibility can be explained in part by the fact that the investments that it produces may be conditional in nature. Joint Implementation pilot phase showed that a higher level of project integration into national environment and development policy would have been desirable (IEPE, 1997). Would things be different with CDM projects, as some developing countries cannot impose their own priorities to foreign investors?

These restrictions have led some people to suggest that CDM should leave behind project flexibility in favour of a more sectoral approach, which will give the developing countries control over the projects, limit the risk of tropical hot air, and improve the potential impact of the CDM.

Enlarging CDM to include sectoral and programme-based approaches

Sectoral "caps" are an illustration of the attempts made to exceed the restrictions linked to project flexibility. The idea is, within a given country, to define reference emission paths for certain economic sectors and assess the CDM activities on the basis of this sectoral reference pattern. Because of the stakes that it offers, the electricity sector, for example, could be subjected to a sectoral approach; this would allow the potential emission credits to be contained, while making easier the implementation and increasing the field of action of the CDM.

This approach was planned in the particular context of Joint Implementation between Annex I countries, working on the hypothesis that the "national governments of the JI/AIJ host countries would use their overall (emission reduction) commitment as a basis to calculate commitments from various economic sectors or technologies" (Jepma et alii, 1999). The idea is to distribute the national commitments among domestic stakeholders by assigning quantified objectives to the economic sectors and maybe to the key economic actors. Instead of monitoring the impact of each project closely, it would then be sufficient to check that the amount of credits exported is consistent with changes in emission levels for each sector on one hand and the accepted sectoral reference on the other hand.

Other proposals aim to regularise the procedures for obtaining emission credits with a view to increasing the incentive nature of the CDM, whilst preserving at the same time a guarantee of a level of project additionality[21]

These various approaches have the common feature of offering a sectoral or programme-based determination of the volume of credits. Their interest is to make their implementation easier and leave it to the host countries to specify which programmes or sectors will be judged "priority". But, they all encounter the same difficulty, namely the definition of sectoral emission scenarios. Finally, these sectoral or programme-based approaches do not provide a real operational solution to the question of additionality. Neither do they offer the adaptability, independence nor overall flexibility based on the exchange of emission permits.

Quantified commitments: the main restriction in a generalised permit exchange scheme

Negotiable emission permit systems have an advantage over basic instruments for projects such as the CDM, in that they produce "closed trading" systems that bring together countries bound by specifically quantified restrictive targets. At the opposite, CDM, like Joint Implementation, is an "open trading" system that allows to associate all the parties to the Convention, including those who have not taken quantified commitments.

Closed trading is an equation that always comes to zero; whatever one win, the other loses, as the country transferring the emission credits to another has its objective altered in consequence. Monitoring this trading is a simple procedure, but the system can only be set up between countries that have undertaken to limit their emissions on a restrictive basis.

Without restrictive undertakings, the CDM remains the only means of exchanging credits from developing countries, but carries the disadvantages mentioned above and also does not encourage those countries to make any real effort to control their greenhouse gas emissions. On the contrary, as it is easier to reduce emissions in countries that have not made yet a specific effort in this area, the less virtuous countries will be those that most easily attract CDM investors by offering low cost reduction opportunities.

The question can then be asked whether general application of binding commitments in developing countries is not the solution to look for in order to allow North/South emission reduction credits exchanges. By taking account of these countries' development needs, the allocation of an emissions budget would provide great incentive to implement more climate-friendly policies in order to benefit from emission rights income. The volume of credits and the income arising from them would be very much higher than those from the CDM projects alone, and also the independence in choosing the emission reduction policies to be implemented would be greater for host countries.

Extending binding commitments to developing countries is not however on the agenda: no developing country is prepared to take a quantified commitment to reduce or even mitigate its greenhouse gas emissions, primarily because of the restrictive effect that such an undertaking would have on its economic development[22].

[21] See especially the analysis of the potential "lever effect" of the CDM on policies and measures in developing countries (Mathy et alii, 2000).

[22] Developing countries are unwilling to accept restrictive commitments as first the Convention and then the Berlin Mandate laid down quantitative commitments on Annex I countries and not on non-Annex I, because of their com-

Conclusion

In the absence of a wholly satisfactory solution, intermediate solutions have been proposed in an attempt to benefit from the adaptability and size of a global flexibility system, which would overcome the stumbling block of negotiating restrictive undertakings with developing countries.

Voluntary commitments by developing countries as suggested during the Kyoto Conference are an example of such intermediate solutions[23]. But none of them are wholly satisfactory or indeed applicable to all developing countries.

In future, however, proposals aimed at integrating developing countries more closely into the international efforts to prevent climatic change should be made. Methods for participation in a generalised permit exchange system should, for example, are offered to developing countries who want them. Even if it raises the difficult question of initial allocation of quotas.

For some developing countries, this question of extending the scope of emission reduction trade to non-Annex I countries has already arisen. For them, it is not a question of being penalised in the technological race with the major industrialised countries because the incentive mechanisms created by the Climate Convention primarily benefit industries in Northern countries. The possibility of these countries' completing MDP projects, either in their own territory or in other Southern countries, and creating financial incentives to implement environment-friendly policies, appears to be unavoidable.

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mon but differentiated responsabilities and respective capabilities.

[23] This idea of voluntary commitments was adapted, in the more sophisticated form of non-restrictive commitments to bring developing countries together in an international exchange system. Several experts defend such an idea, as M. Grubb and C. Philibert, with the concept of "emissions budget" (Philibert, 2000).

Session 2: Emission trading

Rapporteur's Summary *by Reinhard Haas, Energy Economics Group, Vienna University of Technology, Austria and Rainer Walz, ISI Karlsruhe, Germany*

Keywords. Emission trading, cap and trade, rate-based trading, baseline & credit

Abstract. This section summarises the most important issues of the different presentations on *emission trading.* From the EC's point-of-view emission trading is considered to be one of the most promising future tools for combating Global Warming.

The major conclusions of the discussion in this session are: (i) More co-ordination between different countries is required than usually expected; (ii) the implementation of emission trading schemes is more complex than expected in the early theoretical papers; (iii) Regarding the optimal linkage of different systems of ET in various countries further research work is necessary; (iv) It is of high relevance to address other sectors – especially transport – adequately.

Introduction

This section summarises the most important issues of the different presentations on emission trading (ET).

Paul Koutstaal pointed out that a major feature of ET is that they are not project-based, see Figure 1. Hence ET is an important tool which could help to set the right prices for an efficient climate change policy. This is important because many diverse actors with a large number of alternative technical options are involved. The most important question with respect to the different mechanisms is to what extent they result in setting the right carbon price throughout the economy. A currently limiting aspect is that ET focuses solely on the industry.

Major types of ET

The most important types of ET are, see also the depiction in Figure 1:

Cap and Trade (C&T)

An absolute cap on emissions is set. Allowances for these total emission amount are traded. The major disadvantage of C&T is that it is very unlikely that it will be introduced successfully by one single country.

Rate-based Trading

A relative baseline is set by an emission rate e.g. X tons CO_2 per kg steel. Above the rate emission credits must be bought, below credits may be sold.

Baseline & Credit

An absolute baseline for an emission reduction is set throughout the economy. The objective of trade are emission reductions by various companies. A major disadvantage of this approach are the high transaction costs.

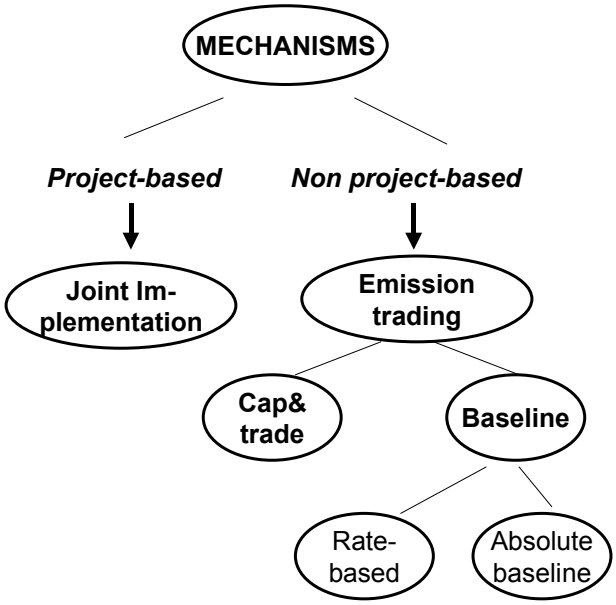

Figure 1. Project-based vs non-project-based approaches for reducing greenhouse gas emissions

The EC's view on ET

From the EC's point-of-view emission trading is considered to be one of the most promising future tools for combating Global Warming. As explained by *Matthieu Wemaere* from the EC's *DG Environment* the expectations and the most important requirements of the EC to ET are:

- Trading will be in addition to and must be compatible with existing policies and measures;
- Most important is the need for non-discriminatory competition
- Expected European added value is €2.1 bn per year;
- Institutional set-up by the EC should facilitate an early start to a multi-country "learning by doing" trade
- Start in 2005 with a limited number of sectors that contribute significantly to total greenhouse gas emissions;
- Trading has to be co-ordinated to link different types of ET systems
- Some controversial issues will still remain open, e.g. if a country wants to sell a credit of technology (e.g. nuclear) to a country where this is not accepted.

A comparison of Denmark's and the UK's proposed trading scheme

The most advanced countries with respect to an implementation of trading schemes are currently Denmark and the UK. *Eva Jensen* and *Margaret Mogford*

gave an insight on the currently discussed ET models in these countries.

In Table 1 the major features of the discussed ET models of Denmark and the UK are compared.

Table 1. Comparison of the currently discussed ET models of Denmark and the UK

Country **Feature:**	**Denmark**	**UK**
Basic principle:	Cap and trade	Mixture
Currency	CO_2	CO_2
Allocation	Grandfathering	Grandfathering
Sectoral Coverage	Power sector only	Various industries
Participation	Mandatory	voluntary with incentives
Up-stream/downstream	only one sector (power industry)	mixture
Type of target	absolute	Relative and absolute
Penalty	rather low tax penalty	Loss of incentive

Conclusions

The major conclusions of this summary are:

- C&T is not attractive without an EU-wide application;
- It is of high relevance to address other sectors – especially transport – adequately;
- more co-ordination between different countries is required than usually expected;
- the implementation of emission trading schemes is more complex than expected in the early theoretical papers;
- Regarding the optimal linkage of different systems of ET in various countries further research work is necessary.

JI and Emission Trading: an economic evaluation.

Paul Koutstaal, Inspectorate of the Budget, Dutch Ministry of Finance, Netherlands[24]

Keywords. Emission trading, Joint Implementation, allocative efficiency

Abstract. Three different trading mechanisms are distinguished on the extent to which they internalise the external costs and set the right price: cap&trade with an absolute cap, trading with a relative cap and baseline&credit projects. From these three, only the classical cap&trade schemes with an absolute cap are allocative efficient. Subsequently, a number of practical issues are considered. It is concluded that, because of these practical problems, trading with a relative cap and project-based mechanisms will be preferred.

Introduction

The Kyoto Protocol mentions three flexible instruments: the Clean Development Mechanism (CDM, article 6), Joint Implementation (JI, article 12) and Emission Trading (ET, article 17). Although the three instruments are clearly distinct in a number of ways, especially with regard to their institutional setting, they have in common that they allow the parties to the protocol to "trade" emissions in one way or the other. Since the drafting of the Kyoto-protocol, numerous studies have further developed these instruments, resulting in various (sub)forms of emission trading. Generally, two main types of emission trading are distinguished; the classical cap-and-trade (C&T) systems and project-based baseline-and-credit trading (B&C), see, for example, Sorrel and Skea (1999), p. 11 and Hargrave c.s. 1998.

In the next section, a distinction is made between trading mechanism based on the degree to which they internalise externalities and set the right price. Subsequently, the main features of the different trading mechanism are described.

Given these characteristics, the advantages and disadvantages of the various forms of emission trading in both developed countries and accession countries are analysed, and an assessment is made of the potential of the various emission trading forms within the EU and the Accession countries.

Trading mechanisms and internalisation of external effects

Recently, there have been a number of developments with respect to both emission trading and to JI which tend to blur the differences between the two concepts. As regards emission trading, studies on the possible design of ET in the U.K. and in the Netherlands have introduced the idea of emission trading with a relative cap instead of an absolute one. With a relative cap, there is not an absolute limit on emissions, instead

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sources have to meet an emission rate expressed in terms of emissions per unit of output or input, for example energy. Sources which emit less than the rate per base unit can sell permits while those who emit more have to buy them. The trade unit is the same as with an absolute cap, a certain amount of emissions, say tons. The main difference with an absolute cap is the uncertainty about future emissions; if the growth of the base unit is higher because of, for example, a higher growth of the sector or the economy, emissions will be higher as well.

For JI as well relative baselines have been promoted, which are basically the same as relative caps.

In order to get a clearer view of the different trading mechanisms developed, a look is taken at the extent to which these mechanisms internalise externalities and set the right price. Allocative efficiency will only be achieved if a trading mechanism will fully internalise externalities and result in the right price throughout the whole economy.

For this analysis, three relevant trading forms are distinguished: the two mechanisms mentioned above, absolute cap and trade (C&T) and baseline and credit (B&C), and a third form, trading with a relative cap based on a rate or performance standard (RT).

The consequences of the different trading mechanisms are presented diagrammatically, depicting the equilibrium of a representative competitive firm and of the industry (see also Baumol & Oates 1988, p. 219-221). For simplicity, it is assumed that emissions are directly proportional to output.

Figure 1 presents the effects of introducing a classical C&T system with an absolute cap on both the representative firm and on long-term industry supply and demand. Initially, before the introduction of C&T, the firm produces quantity Y_C at price P_C, at the point where its marginal cost curve MC_C intersects its average cost curve AC_C (the left-side diagram). The total quantity produced ands consumed is Q_C, the point where the long-run industry supply curve S_C intersects the demand curve D (right-side diagram).

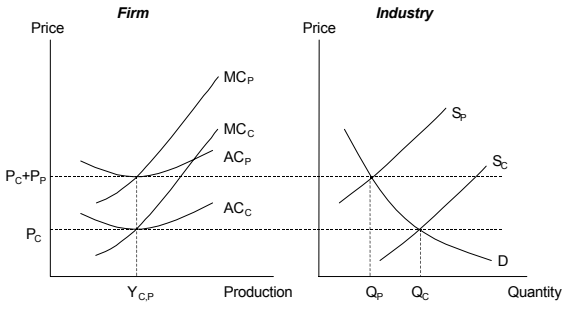

Figure 1 Firm production and industry supply, C&T

Introducing C&T raises the marginal cost curve by the price of the permits to MC_P (because of the direct proportionality of emissions to output). The average cost curve also rises with the permit price to AC_P. Consequently, the final product price now equals $P_C + P_P$, the original product price plus the permit price. The long-run industry supply curve will shift upwards to S_P and total quantity produced declines to Q_P. Consumers have to pay the full permit price and therefore will reduce their consumption.

Figure 2 shows the effect of the introduction of B&C trading. It is assumed here that there is a fixed baseline, however the analysis would not be fundamentally different with a relative baseline. Firms can sell credits at a price of P_P, therefore they will increase marginal costs, including abatement costs, up to the point where the costs of reducing emissions equal the price paid for the credits on the market. This is shown by the shift of the marginal cost curve upwards to MC_S. Given the same permit price P_P as in the C&T system presented in Figure 1, MC_S in Figure 2 equals MC_P in Figure 1. However, the average cost curve will not shift upwards, as in Figure 1, but it will shift downwards and to the left to AC_S. The reason for this is that average costs are reduced because the firm sells credits (in a B&C-system, firms do not have to buy credits). It is assumed here that firms will only be able to generate credits when they are actively in business and consequently can not create credits if they exit or before entering an industry (see also Baumol and Oates 1988, chapter 14 and Farrow 1995 for the relevance of this condition).

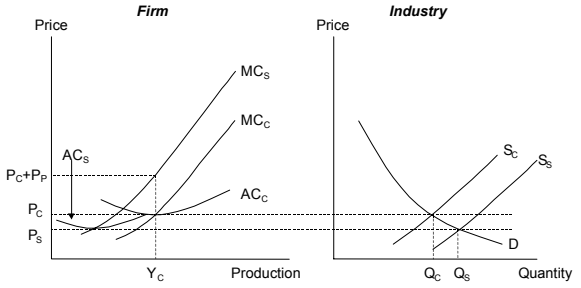

Figure 2. Firm production and industry supply, B&C

As a result of the reduction of the average costs, the long run final product price, as determined by the intersection of MC_S and AC_S, will be P_S instead of $P_C + P_P$ in the case of C&T. Instead of having to pay a higher price, consumers will pay a lower price and therefore consume more: the industry supply curve will shift to the right and quantity consumed and emissions increase (left-side diagram). In general, a B&C-system will have the same consequences as a subsidy for emission reduction (Baumol & Oates 1988, chapter 14). One difference is that the price of the credits will decrease when more firms enter the industry, create credits and sell them on the market, while in the standard subsidy case it is assumed that the subsidy rate is fixed. The price decrease will reduce the incentive to enter the industry and result in a less increased level of output.

RT is presented in Figure 3. Again, MC_C and AC_C represent the average cost curve and the marginal cost curve before the introduction of emission trading. Introducing emission trading with a relative raises the marginal costs, but not to the same extent as the costs are raised with an absolute cap. For the emissions per unit of output below the relative cap,

the rate N in terms of allowed emissions per unit of output, no emission permits are needed and therefore no costs have to be made. Consequently, the marginal and the average cost curves rise with the permit price P_P less the allowed rate N. The final product price therefore is $P_C + P_P - N$. Consumers pay less than they would in the case of an absolute cap and the industry supply curve does not shift as much to the left as was the case under C&T. Industry output, determined by the intersection of the industry supply curve S_R and the demand curve D, is Q_R, less than the output without RT, but more than the output with C&T.

Above, it has been assumed that the representative firm in the industry was a net buyer of permits. Therefore, $P_P - N > 0$ and the product price rises when RT is introduced. However, the price might also fall when the representative firm is a net seller of permits. In that case, industry supply would shift to the right and total output and therefore emissions from this industry would increase.

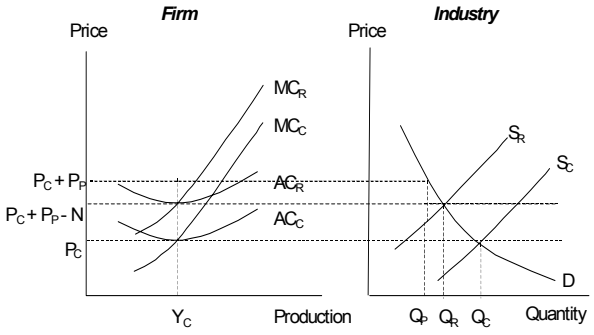

Figure 3 Firm production and industry supply, RT

It should be noted that the analysis will be modified when transaction costs are taken into account. This will be especially important with B&C, where transaction costs are expected to be significant. The main effect is that transaction costs increase costs and therefore price P_S will be higher than in the case without transaction costs.

The importance of introducing right prices in the economy for all producers and consumers should not be underestimated, especially in the context of climate change. The reason for this is that the reduction of greenhouse gases depends on system innovations, which involve many, diverse actors with a large number of alternative technical options. These adjustments are complex, have a long time horizon and are difficult to implement efficiently with command-and-control regulation. Economic instruments such as tradable emission permits and charges which set the right price on emissions provide an incentive at every level of the economy and thereby ensure that, not withstanding complex relations between producers and consumers, emission reduction is achieved in an efficient way.

This can be illustrated by a simple example. Suppose that an agreement is made with car manufacturers to reduce fuel use per kilometre. One of the solutions would be to use less heavy materials in the production of the car. However, the production of these materials might require more energy than the heavier materials used before. Consequently, the energy savings realised through the use of the lighter materials will be more or less offset by the higher energy use in the production of these materials. If carbon is priced at the right level throughout the whole economy, the higher price of the lighter materials will be taken into account in the production of the more efficient car, which is not the case with the agreement.

The next section describes the main features of the three trading mechanisms distinguished above.

	CAP-AND-TRADE (C&T)	**RELATIVE CAP TRADING (RT)**	**BASELINE-AND-CREDIT (B&C)**
Tradable object	Emissions	Emissions	Emission reductions
Absolute cap on emissions	Yes	Yes, if the rate is regularly adjusted in order to realise the intended emission limit	No
		No, if the rate is not adjusted regularly	
Simplicity of grandfathering permits	Simple to complicated	Simple, assuming that performance standards are already in use	Not relevant
Revenue raising	Yes, in case of an auction No, with grandfathering	No	No
Verification and monitoring	Simple and at relative modest costs	Simple and at relative modest costs	Depending on the baseline, from simple and modest costs to complicated en expensive
Entry barriers	Possible	No	No
Implementation	Should be introduced instead of existing regulation	Can be introduced in addition to existing regulation	Can be introduced in addition to existing regulation

The table above presents the most important characteristics of the three main trading mechanisms presented above. These characteristics include the main design issues and institutional elements.

Characteristics of trading mechanisms

The tradable object is in principle the same for all three mechanisms: a certain amount of reduced emissions. For example, a ton of CO_2. The difference is that the amount of emission permits which can be brought onto the market is determined in different ways. Under a C&T system, a source can bring all of its emissions onto the market, as long as he does not emit more than the number of permits he retains. With RT, a source can sell permits with the restriction that emissions, less the emission permits it has sold, are equal to or less than the rate. This rate can be expressed in emissions per unit of output or emissions per unit of energy used. Wit B&C, emission reductions can be brought on the market if a source emits less than the allotted baseline.

Only with C&T is there an absolute cap. With both RT and B&C the resulting level of emissions depends on the level of activities; the higher the level of activity, the more emissions. One could adjust the rate when the level of production is higher than expected, but this might be politically difficult.

The grandfathering of permits can be complex in the case of C&T. It has to be decided how to divide the permits among the participants, which may need extensive negotiations. Furthermore, it has to be avoided that those who have not reduced emissions in the past are rewarded by a large amount of permits, which would be the case if permits are distributed strictly on the basis of historic emissions. A relative cap can be easier, especially when the rate can be based on existing performance standards. However, if such a rate does not exist, it might be more complicated.

Auctioned permits raise revenue which can be used to reduce non-optimal taxation. With RT, B&C and grandfathering in C&T, sources acquire their permits for free and no revenue is raised. Consequently, abatement costs will be considerably higher (Pezzey 1998).

In contrast to C&T and RT, it is necessary for each B&C project to determine the specific baseline. Consequently, the costs of verification and monitoring will be high, which will reduce trade.

It has been argued that C&T might provide a barrier against entrants, especially when the established firms receive their permits for free. Grandfathering permits however does not necessarily raise entry barriers, because the use of grandfathered permits entails opportunity costs. Entry barriers might be raised if capital markets do not work perfect and therefore entrants have to pay higher capital costs than the established firms. However, the extent to which this would raise entry barriers in the case of CO_2 appears to be limited (see Koutstaal 1997, ch. 4).

With RT and B&C, entrants have to meet either the same relative cap (RT) or they can be allotted a baseline on the same terms (B&C) as the established firms. Therefore there is no entry barrier, instead there is an incentive for new firms to enter the market, which is one of the reasons for the inefficiency of these schemes which has been described above.

RT and B&C can be combined with existing instruments such as directives and voluntary agreements, especially if these include rates which can be used as relative caps or baselines. It is difficult to combine C&T with existing regulation, because this could hinder trade and therefore reduce efficiency.

Consequences for the practical choice of trading mechanisms

From the point of view of economic efficiency, C&T is to be preferred above the other two variants. Only with C&T will the prices be set at the optimum level and will all producers and consumers have the right incentive to reduce their emissions and use of CO_2-intensive products. Moreover, only a C&T system will guarantee that the emissions will remain below the limit. Last, C&T allows for the possibility to auction permits and raise revenue, making it possible to lower distortionary taxes, which considerably reduces the costs of controlling CO_2 emissions.

However, implementing C&T takes considerably more than the implementation of the other two trading mechanisms. C&T is difficult to introduce in addition to existing regulation, moreover it is hardly possible to experiment with C&T. Such a system has to be introduced at a sufficient large scale for the development of a well-functioning market, the choice for C&T is a go/no-go decision, not something in between. The other two mechanisms can be introduced on top of existing regulation, which makes it possible to introduce trading in a more gradual way.

C&T and RT tend to be less acceptable to firms than B&C because targets are mandatory instead of voluntary participation in trading. C&T, in addition, has the disadvantage from the point of view of firms that emissions are bound to an absolute ceiling, which means that an increase of the firms activities entails higher costs, while within RT production can be expanded without increasing costs.

Not only are C&T systems of limited acceptability for firms, authorities are also reluctant to introduce such systems. Not only because this would mean a major break with the existing regulatory system, but also because it would put the national industry at a competitive disadvantage vis-à-vis competitors in other countries who face different, less costly, policies. It might be argued that all Annex I countries have accepted emission reduction targets under the Kyoto-protocol and therefore firms in all countries will have to be confronted with policy measures and therefore higher costs. However, marginal abatement costs differ considerably between countries, as a number of studies have shown (see, for example, Capros & Mantzos 2000, or Shared Analysis Project 1999). Consequently, firms will not face a level playing field.

The fear for loss of competitiveness has influenced the design of a number of trading systems in various MS of the EU. The Danish trading scheme levies a modest fine see the paper by E. Jensen) when the

participants do not have sufficient permits to cover their emissions, which effectively means that the participating firms can limit their costs by choosing the fine instead of compliance. In the proposal for a UK trading scheme, participants can take part in an absolute sector (C&T), a unit sector (RT) or a project sector (B&C). Caps in the absolute sector are negotiated between the government and the firms in question, the costs of achieving these limits will probably be limited. In the Netherlands, a commission established by the government is making a distinction between those firms who are exposed to competition from other countries (the so-called exposed sector) and those who are not exposed (the sheltered sector). For the exposed sector, the commission is considering RT, for the sheltered sector a C&T system.

Given this reluctance of national governments to introduce (effective) C&T systems in isolation, the introduction of a comprehensive, effective C&T system will have to be co-ordinated at the international level. The proposal of the European Commission for an EU C&T-system for the energy-intensive sectors within the EU (European Commission 2000) is an example of such an international co-ordinated trading system.

Given the various arguments presented above, what would be the options for Accession countries? Implementing an effective C&T-system in isolation would not appear to be an attractive option, for the same reasons which restrain the current Member States from introducing C&T in an effective way. A difference however is that Accession countries can achieve their targets at a lower price, which might make it less of a problem to introduce a C&T-system, because the economic consequences for the sectors involved would be less, given the lower costs. However, the costs and regulatory requirements of the introduction of C&T might be prohibitive for the Accession countries. In case the EU would introduce C&T at the EU-level, it would be logical to assume that the Accession countries would join in as well.

If C&T is not an option for one reason or another, the practical choice for Accession countries is limited to RT and JI. RT with mandatory targets, or in other words, fast track JI, has a number of advantages over B&C. Transaction costs will be lower than in B&C, which will lower costs and increase the possibilities for foreign investors who are willing to buy emission reductions. In addition, it is more likely that a well-functioning market will develop. Externalities are internalised to a stronger extent, which will provide a stronger incentive to consumers and increase the efficiency of emission abatement within the economy. In addition, mandatory emission rates provide the authorities with an instrument which can be used to achieve the emission reduction targets agreed in Kyoto, especially when the rates are adjusted on a regular basis when necessary to achieve emission limits. Regulatory requirements will be more extensive than in project-based B&C trading, however monitoring and verification of the baselines will be less complicated than with other baseline methodologies in B&C trading. One does not necessarily have to chose between RT or B&C, both mechanisms can exist side-by-side (as is proposed in the British study). However, transaction costs of non rate-based JI will be higher than those of RT, therefore JI might be prised out of the market.

Conclusions

Recent developments have obscured the differences between cap&trade tradable emission schemes and baseline&credit projects. In this paper, trading schemes are distinguished on the bases of the economic efficiency of the different trading mechanisms. It has been shown that only C&T fully internalises the external costs.

However, it will be more difficult to implement C&T than RT and B&C for a number of reasons:

1. In order to be successful, a sufficient large C&T-scheme has to be implemented, experimenting on a small scale or gradual phasing in is not possible;
2. Environmental effective C&T has to be implemented at the international level (at least at the lebvel of the EU), otherwise fear of loss of competitiveness will limit the effectiveness of schemes which will be implemented;
3. RT and B&C can be implemented on top of existing regulation.

This is reflected by the fact that some of the trading schemes which are currently being designed in a number of countries focus to a smaller or greater extent on the less efficient trading mechanisms such as RT and B&C. The extent to which the reduced efficiency will be a real problem depends on the magnitude of this efficiency loss, which has to be determined by further empiric research.

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The Green Paper of the European Commission: A framework for emission trading at European level? On-going research activities.[25]

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Keywords. Emission trading, flexibility instruments, Kyoto Protocol, European Union, climate change

Abstract. The paper presents the position of the European Commission on the specific role of the Commission in linking national emission trading systems. It discusses point by point the areas where the European Commission might see the need for co-ordination (currency, direct / indirect emissions, upstream / downstream trading, monitoring standards, reporting & verification, compliance, nature of targets, project mechanisms and emission trading, registries) or where the Commission role might be less clearly defined (allocation methodology, stringency of targets, sectoral coverage). In fact, it appears that with EU emission trading schemes more needs to be co-ordinated than first thought and certainly it is the context of the implications of national emissions trading schemes in the internal market which is at the heart of the possible Community intervention.

Introduction

The Commission published in March 2000 a Green Paper on emission trading. This paper is not a political document, it is rather a conceptual document. The idea was to first provoke a debate within the Community on the instrument of emission trading and also to try to improve the understanding on what trading is about while involving the stakeholders. There was a sort of consultation organised through the publication of the Green Paper. A lot of questions were raised on a number of outstanding issues in relation to trading but certainly the Green Paper at least states very clearly that emission trading is a very important instrument for the EU to fulfil its commitment agreement to Kyoto of -8%. Nevertheless, the paper also pointed out that, in accordance with the EU position on the flexible mechanism, trading would and certainly should stay supplemental to political domestic measures – supplementarity is very well highlighted in the Green Paper – but also that trading, if this is to be established at either national or community level, should be compatible with existing political measures which is still, to the Commission's point of view, the main means to combat climate change. Existing policies and measures are certainly the regulatory approach, which is the traditional approach, but also other economic instruments like taxation or negotiated agreements. It was important to remind that trading is before all not the panacea but a means to reduce emissions at lower costs.

European "added value"

The Commission conducted a study to see what would be the economic value of having a large trading system within the Community and one outcome was that at least 2.1 billion Euro per year could be saved if the sectors identified in the Green paper would be covered by a Community scheme on emissions trading. To be clear on one point: The Green Paper does not say that we should have a Community-wide scheme on trading but actually it asks the question should we have a community-wide scheme or should we co-ordinate national Member States schemes or should we not? Is there an interest, in particular in the industry to have something either co-ordinated or harmonised or not? It will appear later on whether we are going in one way or another. But anyway we just came to the conclusion that the wider the scale of such a trading scheme the lower the cost. If we have a system at Community level covering those sectors that are identified in the Green Paper we could save those amounts of compliance costs per year and the sectors we are referring to now are the electricity and heat sectors, aluminium production, chemicals, refineries, paper production and iron/steel production. That would cover more or less 45% of CO_2 emissions within the Community.

It is clear that emission trading systems have to be compatible with the rules that already exists within the Community to protect and preserve the smooth functioning of the internal market, which argues the case to organise or at least co-ordinate to a certain degree at Community level, but again the Green Paper raised the issue and does not give the answer and we will see later on as well where we are on this issue.

We all recognise that trading is a new instrument and I can just say that it was a little cultural revolution even within the European Commission when we published the Green Paper because most of the people who are working in the Commission DG Environment are more familiar with the regulatory approach, which is the traditional recommended control approach, and we had to face a lot of reluctance even from our colleagues on this issue and it was very difficult to convince of the added value of emissions trading to combat climate change, but I think we succeeded to do that. We also have to recognise that the concept of permits is something that already existed in the EU environment policy (particularly in the Kyoto Protocol, but also in fishery and agricultural policies), and we thought if this already exists we should try also to use this instrument for combating climate change.

The Green Paper also explained that there should be a reflection about having the Community organising a system on trading. This is because the Green Paper has been published in the perspective of a future implementation of the Kyoto Protocol, i.e in a multilateral context where parties exchange allowances or part of a signed amount. It was thought that the institutional set-up that already exists at Commu-

[25] Transcription of the oral presentation by M. Wemaere.

nity level would serve as a good basis to see how parties, i.e. Member States, can exchange one to the other, even though we know that the exchange will take place at a legal entity level, but it was thought that the institutional set-up was a very good framework to start at an early stage to prepare for the implementation of the Kyoto Protocol.

It is worth reminding that trading takes place in a context where the Community is in a specific situation. The Community has its own objective under the Kyoto Protocol of -8%, but also the Council of Ministers have decided to redistribute this target of -8% among the Member States the so-called Burden Sharing Agreement and we believe that emissions trading, if it would take place one day within the Community, will be on top of the Burden Sharing Agreement. This Agreement certainly does not require the use of trading but at least it will have many consequences on how trading will be implemented either at national level but also at Community level.

Advantages of emissions trading

The Green Paper tries to explain what are the advantages of emissions trading. The most important point is certainly that it secures a predetermined environmental outcome and this is very important. It was a very good argument when we discussed with our colleagues within DG Environment who were more in favour of a regulatory approach because we could explain to them that the regulatory approach with legislative action would not prevent new emissions or additional emissions generated through new installations that would take place in the future and this idea of securing this predetermined environmental outcome was certainly our best argument at home. In addition, companies certainly know their costs, so they are best placed to see opportunities – so let companies trade

Allocation

The Green Paper insists very much on the need to ensure non-discrimination for competition and this is again the impact of internal market rules and competition rules and also to ensure equal access for new entrance in a scheme at whatever level, national or community level. The Green Paper apparently prefers auctioning – at least some people have that feeling. It is true that it was seen as preferable from the Commission's point of view: first of all it implements the polluter-must-pay principle, it is transparent and helps to ensure non-discrimination of competition among the actors of the trading scheme. So we were quite enthusiastic about auctioning and also the recycling of revenues that could be generated through auctioning. Auctioning was thought to be very useful even though the Community would never say something on how to recycle those revenues. We are aware that the industry does not like very much auctioning, first of all because they have to pay for something that they had for free before, and also because they are sure that the recycling of revenues would never be as neutral as they would like and certainly the Community would never be in a position to say to the Member States "well, you should recycle in this way or that one".

Grandfathering is more politically expedient. It requires from each government to decide on which sector would be covered but we certainly think that there might be a risk for governments to try to support some sectors and so we are very concerned that this grandfathering method would lead to disguised state aid. We do not say that grandfathering will lead to state aid, this is not the point, but on a case-by case basis it could be the case. Right now our position is that we accept that auctioning and grandfathering could be combined. We think that the allocation method is not that important in fact in terms of environmental integrity, because it does not have a strict impact on the environmental integrity of the scheme. But we are concerned about the internal market rules and respecting the internal market rules. This is why, even if those two methods are combined either progressively or distributed in a certain way, governments should be very aware not to go for disguised state-aids.

Getting started gradually

The basic idea of the Green Paper is to ask stake holders whether they would like to have a scheme at Community level, starting prior to the first commitment period around 2005, because we think it is a learning-by-doing exercise and it would be very useful for the Community to prepare itself for future trading under the Kyoto Protocol. In that perspective we also thought that it would be more easy to start with a limited number of sectors still under this perspective of learning-by-doing. We proposed to cover mainly the energy sector but also the other activities covered by the IPPC Directive and the Large Combustion Plant Directive. They could provide a good basis to define the scope of obligation of a Community scheme on trading. Such a scheme would certainly concentrate at first on carbon dioxide. The intention is not to exclude the other gases, but again in the spirit of learning first, it would be preferable to start with CO_2.

Consultation phase

The Commission has received many submissions from both governments and the industry on the Green Paper. The European Parliament has also been consulted. These submissions on DG Environment's website.

Consultation phase

- 95 submissions
- 700 pages
- 11 governments (incl. Norway)
- 42 Business Associations
- 24 Companies
- Euro Parliament, Committee of Regions, Economic & Social Committee ...

The European Climate Change Programme (ECCP) - Working Group 1

Definitely the Green Paper was the first step and it was set up with the intention to launch consultation among stakeholders. Simultaneously, the Commission launched a large programme, "European Climate Change Programme". The overall objective of this programme is to identify the essential limits for the future strategy of the European Union for the implementation of the Kyoto Protocol. It basically addresses policies and measures in all sectors. It functions on the basis of what we did in the AutoOil Programme: it is a multi-stakeholder consultation process which means there are NGOs, industry representatives, Member States and also the general public. This ECCP operates with six working groups that are chaired by different persons from different sectors of the Commission. It is also an integration exercise to help people from other DGs to understand and take interest in emissions trading and in climate change in general. There is one working group on energy supply, one on energy conservation, one on transport, research, on agriculture, and one on the flexible mechanisms which is mainly focussed on emissions trading. There was just one discussion on the interactions between emissions trading and the project-based mechanism under Kyoto. This working group has met quite a number of times and they have addressed a number of important issues like absolute vs. relative targets, but also the allocation methods and the implications of the allocation method with regard to internal market rules and competition rules, impact on competitiveness, and relationship with the project-based mechanisms. Within the group, certainly because it comprises representatives of Member States which have already initiated emission trading at national level, there was a specific request to address the linking of schemes. Should we go ahead with various national schemes which could operate in a complete disaggregated manner without any co-ordination, or whether it would be necessary to link those schemes at least with respect to the rules for the internal market and competition.

Why co-ordinate trading?

So why co-ordinate trading? This is where we are now. Certainly cost savings increase with number participants. But, the more participants we want, the more we have to co-ordinate, or, at least we have to think about this co-ordination issue. Two questions in that respect are what elements would need to be compatible from one scheme to another and what are the minimum building blocks of an EU approach?

Why are any rules needed?

Let us start with the rules that may be needed. To achieve environmental policy objectives, we think that there is a need to co-ordinate and to fix a rule for such a co-ordination because one lax scheme in one Member State could contaminate the others. Linking separate schemes makes prevailing the lowest common denominator if a minimum set of rules is not specified, which, from an environmental point of view, would be very good.

Preserving and enhancing the internal market is the other main objective to follow. We think, and so does the industry, that a co-ordinated scheme would be preferable because it takes place in a framework at Community level with its existing rules on competition and the internal market. Co-ordination would preserve the internal market with that respect. It would also help the Commission to manage infringement procedures and would further limit the case of infringement procedures for non-respect of competition rules. This is also a way to manage future implementation of emission trading schemes in a given context, which is very particular because it is the EU context with its specific rules.

And lastly we think that rules are also needed because we think "SHOULD DO" will not be enough. When you look at the draft decision text on the Article 17, it is clear that we talk about the overall purpose, about eligibility criteria to fulfil basically the Article 5 and 7 requirements. Then there is the liability provision. Beyond that there is not much. In order to have a system operational, we need to have more rules. More rules does not mean more bureaucracy and more legislation, this is not what I am talking about, it is just to make it operational in a more efficient way.

I would like to give two examples which rules are needed. We know the Kyoto level and we know the UN rule or in addition to the UN rule. For example, in one scheme are we going to have an upstream or a downstream approach to define the sectoral coverage of the scheme? This is not set by Kyoto. Certainly not. This might raise some concerns in terms of competitiveness, also some concerns in terms of environmental outcome. Also, are we going to count direct or indirect emissions? We will certainly say something about that. We have the feeling that if we have different national schemes counting, in one of these, only direct emissions, while another counts indirect emissions as well, there might be some problems in terms of double counting. We have a good example with the Danish scheme which counts only direct emissions, whereas the UK scheme will count indirect emissions. We do not think that it is worth imposing something at Community level which says it must be only direct or indirect, but we try to co-

ordinate it and try to limit the problems which arise later on.

What "must" & what "may"?

What musts and what mays are in? It is a first attempt to see what should be requiring a co-ordinated response at Community level (part 1). Part 2 will address further issues for which it could be desirable to have a Community response. It takes into consideration the rules for the smooth functioning of the internal market.

"Part 1":	"Part 2":
⌘ Currency	⌘ Allocation methodology
⌘ Direct / Indirect	⌘ Stringency of targets
⌘ Upstream / downstream	⌘ Sectoral coverage
⌘ Monitoring standards	
⌘ Reporting & verification	
⌘ Compliance	
⌘ Nature of targets	
⌘ Project Mechanisms	
⌘ Registries	

So first of all we need to know what we are going to talk about, so what is going to be exchanged, what exactly would be the denomination of what we are going to exchange? There is not an absolute need to translate everything into CO_2 equivalent, though the Kyoto Protocol is based on equivalent emissions. But at least we need to agree on conversion rates and on reference denominations, to be sure that, in the end, when we will count in every Member State, what every Member State has done to fulfil its commitment under the Burden Sharing Agreement, we all talk the same language.

The second point is about direct and indirect emissions. Direct emissions as those which occur in a production facility directly, while indirect emissions are those which do not directly occur on-site; they are avoided emissions bought by the facility as a production factor. We are afraid that, if one Member State counts both direct and indirect emissions, there might be a phenomenon of double counting. The energy supply sector is going to switch fuels to reduce its emissions and is then going to count the emissions it has generated directly, but the final user may also consider to count the emissions in the electricity he had to bought. It seems therefore necessary to be very clear on what to do with direct and indirect emissions.

We have not yet a complete view on how to address this at Community level, but we should certainly assume that the Member State which decides to count indirect emissions should assume the responsibility that what it imports as emissions from another Member State (because this is also sort of indirect emission counting), will be counted as emission free, while what it exports should be counted for the fulfilment of its own target. It is rather in the context of trading between one Member State and the other that this direct and indirect counting measurement might create a problem. In a context, which is now modified through the liberalisation of the energy and the gas market, there might be implications of counting indirect emissions. It is the question of assuming the responsibility of counting the imports of emissions completely free, in the system that could be co-ordinated at Community level.

Upstream vs. downstream approach: we have the feeling there could also be a problem of double counting because, if there is an upstream approach, it is the producer of the fossil fuel that is going to be participating in the scheme and if, in another Member State, its a downstream approach, then it is going to be the end user of the electricity or energy which is going to be counted, so there might be also a problem in that respect. We should find ways to avoid that somebody will pay twice for the emission reduction, because the price of the permits will be passing on, let's say, from the one who already paid the cost at the upstream level to the one who is going to use the energy in the end.

On monitoring standards: we think it is very important to define common standards on how to measure emissions and emission reductions. We have the feeling that if there is no common standard on monitoring, there would be the possibility that one Member State may be very lax in how to count its emissions at plant level. Then one plant, or one person participating in the scheme, could sell all its permits and understate its level of emissions. If there is no strict monitoring standard, we feel there would be some problem with the final environmental outcome.

There are different possibilities to standardise monitoring requirements at Community level. It is not necessarily through a legislative approach. One could think about asking the European Centre of Standardisation to work on that and Member States as well as industries should be involved in the elaboration of the standards. This could be a part of the task to be done at Community level.

Recording and verification is also very important to our mind. Verification is a complicated issue because it might involve a controlling authority. It might be quite difficult to harmonise this at Community level, but at least we could say that verification could be done on a periodical basis and those permits that have been used in the past should be retired. We could think about those elements that would not put a big constraint on Member States, but while entering the overall system, would operate the different national systems in a very co-ordinated manner at a Community level.

Compliance is also a very important issue for us. We think that those Member States which would not adopt a strong and robust compliance provisions, there will be an attempt from those companies that operate in more strict Member State to sell in the first ones. It would again be a lower denominator that would win in that case. For example, we take the Danish scheme which has a penalty rate of 40 Danish crowns per tonne of CO_2 for each exceeding tonne of

CO_2 equivalent. If there is a Member State with 41 or 45 Danish crowns, there is a risk of permits flowing from Denmark to the other state. This would certainly create a lot of problems for Denmark to achieve its target under the Kyoto Protocol, bearing in mind that Denmark has a hard target under the Burden Sharing agreement.

On the nature of targets, we do not have strong feelings actually. We do not think it is necessary to take a position on absolute vs. relative targets. We could imagine that the Member States use relative targets. But which has to be co-ordinated at least is, that in the national scheme, there should be an overall cap on all companies that face only a relative target. And in case the relative targets are below the overall cap, it is up to the Member State to adopt additional policy measures, or, if it does not have the time, because this might be at the very last moment, to buy more allowances in other Member States. In this case the responsibility rests on the Member State and not on companies and that is why we tend to agree in the Commission on absolute targets, also because the Kyoto Protocol is expressed in absolute and not in relative targets. Again, to be sure we are talking in the same language, to be sure we are working on the same basis, we would favour absolute targets, but this is not to be fixed or to be imposed at Community level, this is just to be co-ordinated as explained before.

Project mechanisms: If, in one Member state, legal entities participating in an emissions trading scheme can also get access to credits generated by JI projects, and this is not the case in another member state, may create a problem in the sense that it will make it easier for those who can get access to new credits to achieve their own targets. This is, however, not the biggest problem. The biggest problem is, if we have Member States which have lax requirements for project-based mechanisms or which accept credits from controversial projects (lets say nuclear, large hydro, not very clean coal which are refused in another Member State because of the political question of excluding nuclear in the CDM or JI), there might be a problem in terms of equal access to credits generated by those project-based mechanisms. In these cases, we think that it would be necessary to co-ordinate as well.

Registry: we think - and also the members of the Working Group 1 of the ECCP agreed on this very clearly - that it would be necessary to co-ordinate or at least harmonise the minimum of information on how many permits are sold and how is it represented. It is also very important with regard to the monitoring of greenhouse gases throughout Europe and the links that could be made with the monitoring decision which is a Council decision of 1993 amended in 1999, whereby the Member States report to the Commission the monitoring of their emissions.

Part 2 is what is not necessarily to be co-ordinated, but what might be desirable to co-ordinate. As you see these are the three most controversial issues. We do not think that this will have a very strong impact on the environmental outcome we expect from trading. We have some strong feelings about how allocation could have impacts on the internal market and, more importantly, what state aids could be disguised through the allocation method used by the Member States, but we have rules at community level on competition and, if there is a problem, we expect that some of the Member States or some companies will draw the attention of the Commission to whatever problem could be caused by one allocation methodology in one Member State. Therefore we do not think it absolutely necessary to co-ordinate allocation methods between the Member States.

On the stringency of targets: as I said before, this is not something for the Community to look at, this is a question for the Member States to decide how many permits to give to their legal entities and what should be done in terms of political measures and how those two things should be complementary. So there is not a very involvement necessary from our side.

Sectoral coverage: it is something we are still thinking about. In the Green Paper we propose a very strange system of opt-in opt-out because we understood very clearly that we would not go with a full coverage at Community level, for very clear reasons. We think it could be left to the Member States to decide what sector to cover or not, but we will be also very cautious on what sectors are going to be covered and more importantly on what sector will not be covered. For example, one entity might participate in a national emission trading scheme, where permits are auctioned, for which it has to pay. If there is another sector, which is in competition with him and is not covered by any other measure, the legal entity participating in the emission trading scheme would not be in the position to ask for compensation, according to Community law, to its government for reverse discrimination, and in the absence of any Community instrument co-ordinating at least basic elements of emissions trading, it would be very difficult for him to seek a solution at Community level.

Preliminary conclusions

Conclusions can only be preliminary so far. But in fact more needs to be co-ordinated than we first thought and certainly it is the context of all the implications of national emissions trading schemes in the internal market which is at the heart of the Community intervention.

"Work in progress" in WG1

- The records are on the website
- The GP submissions are on website
- No agreement at UN level would be a set back to emissions trading in EU
  - in terms of timing
  - in terms of company involvement (given arguments on competitiveness)
  - as a "driver" to meet targets cost-effectively

On June 26/27, there will be a large conference in Brussels with many participants to present the results of the ECCP. On the basis of this final report and the debate taking place in Brussels in June, at this conference, the Commission will present a communication in Autumn 2001 and in this communication, the Commission will say more explicitly what are its intentions with respect to emissions trading at community level. *

References

European Commission, DG Environment,
www.europa.eu.int/comm/environment/climat/
home_en.htm

– Addition by the editor given recent developments at the EU level

The College of Commissioners the EU has adopted on 23 October 2001 a ratification package that will now be passed on to Parliament and the Council. Download documents from the following links:

Ratification proposal

europa.eu.int/comm/environment/climat/docs.htm
PAMs package (scroll down!)
europa.eu.int/comm/environment/climat/eccp.htm

Emission Trading Directive

europa.eu.int/comm/environment/climat/
emission.htm
Follow the flashing "NEW" logos :-)

EU press release

http://europa.eu.int/rapid/start/cgi/guesten.ksh?p_
action.gettxt=gt&doc=IP/01/1465|0|RAPID&lg=EN

Commission proposes ratification of Kyoto Protocol and emissions trading system (IP/01/1465), Brussels, 23 October 2001

Today the European Commission adopted a major package of initiatives to combat climate change. It comprises a proposal for the EC to ratify the Kyoto Protocol; a draft Directive on greenhouse gas emissions trading within the EU; and a Communication setting out further measures for reducing greenhouse gas emissions. The Commission thereby reaffirmed the EU's commitment to bring the Kyoto Protocol into force before the World Summit on Sustainable Development ("Rio+10") in Johannesburg in September 2002 and meet its Kyoto target. Environment Commissioner Margot Wallström said: "With these proposals, we pursue the EU's ambition to provide leadership in addressing climate change. By presenting proposals for an emissions trading system and other emission reduction measures in parallel to the ratification instrument we wish to demonstrate that we are serious about delivering on the commitments we have signed up to. I hope that other Parties to the Kyoto Protocol will also move quickly towards its ratification and implementation. We have no time to lose in combating climate change". She added: "The emissions trading system will be an important cornerstone in our strategy to reduce emissions in the most cost-effective way."

Council Decision on the ratification of the Kyoto Protocol:

Both the European Community and the Member States have to ratify the Kyoto Protocol to make it binding for the EU, including the objective for the EU to reduce its greenhouse gas emissions by 8% between 1990 and 2008-2012. The Commission has therefore presented a proposal for a Council Decision concerning the conclusion of the Protocol on behalf of the European Community. Once adopted by the Council, the Decision will also make legally binding the contributions to be made by each Member State to the Kyoto -8% target. This so-called "burden-sharing" was already agreed by the Environment Council on 16 June 1998. It allows some Member States to increase their emissions while others reduce them, so that the EU jointly achieves its target. The Council Decision would also require Member States to prepare their ratification by 14 June 2002, so that the European Community and its Member States can jointly deposit their ratification instruments with the Secretary-General of the United Nations before the World Summit on Sustainable Development in September 2002.

Communication on the implementation of the European Climate Change Programme:

The EU is committed not only to the ratification and early entry-into-force of the Kyoto Protocol but also to meeting its 8% emission target. The Commission has therefore today announced a series of 10 actions to further reduce greenhouse gas emissions in the EU. These actions have been identified as particularly cost-effective and feasible in the short term under the European Climate Change Programme (ECCP).

Some of these actions are already contained in the Commission's Green Paper on the Security of Energy Supply [1] and the recent White Paper on the Common Transport Policy [2]. The Commission intends to make specific proposals to implement these actions over the next two years. They include for example legislation on combined heat and power, energy-efficiency requirements for end-use equipment and energy-demand management, as well as initiatives to promote energy efficiency in public procurement and for shifting traffic from road transport to other transport modes.

In addition, the Commission will present proposals for bringing the Community's greenhouse gas monitoring mechanism in line with the requirements of the Kyoto Protocol, and on the use of emission credits from the Clean Development Mechanism and Joint Implementation under the Kyoto Protocol in the new EU emissions trading system (see below).

These actions are included on the list of about 40 measures identified under the Commission's European Climate Change Programme (ECCP). The ECCP was launched by the Commission in March 2000 [3] and has involved a broad range of stake-

holders and experts in identifying and making recommendations on cost-effective ways to reduce greenhouse gas emissions. Its first results were presented in a report in June 2001 and presented at a conference in July [4]. The 40 possible measures are estimated to have a combined emission reduction potential of roughly the double of what is likely to be needed for the EU to reach its Kyoto target. The 10 measures announced in the Communication alone should be sufficient to fill close to half of the gap between the EU's forecasted emissions in 2010 and its Kyoto target (340 Mt CO_2 eq.). All of this potential can be realised at a low cost to the economy (below an estimated 20€ per tonne of CO_2 eq.).

The European Climate Change Programme will continue, and other emission reduction measures already identified in the first phase will be examined more closely.

Directive on greenhouse gas emissions trading:

An internal EU system for greenhouse gas emissions trading is an important cornerstone in the Commission's strategy for reaching the Kyoto target in the most cost-effective way. Emissions trading will reduce the cost of emission reductions by ensuring that these reductions are made where they are least costly. At the same time, emissions trading is environmentally effective by achieving a pre-determined emission reduction from the activities covered. The Commission launched a broad consultation on emissions trading by publishing a Green Paper in March 2000, and further details of the system envisaged have been discussed with stakeholders under the European Climate Change Programme. The proposed Directive aims at establishing an EU framework for emissions trading and an EU-wide market for emissions. It thereby ensures the proper functioning of the internal market and prevents distortions of competition that might arise from separate national emission trading schemes.

The Commission proposes that emissions trading in the EU should start in 2005, and in a first phase cover CO_2 emissions from large industrial and energy activities.

These are estimated to account for about 46% of the EU's total CO_2 emissions in 2010, and about 4,000 to 5,000 installations across the EU will be affected. In 2004 the Commission will consider an extension of the Directive to other sectors and greenhouse gases.

Each installation covered by the Directive will have to apply to the competent authority in its Member State for a permit allowing it to emit greenhouse gases. This permitting procedure shall be fully coordinated with the procedure under Directive 96/61/EC on Integrated Pollution Prevention and Control (IPPC) in order to avoid unnecessary bureaucracy. On the basis of the permits, Member States shall allocate emission allowances to each installation every year. They will gradually reduce the number of these allowances over time to ensure that emissions are reduced. It is these allowances that can be traded, although no operator of an installation will be forced to trade. By 31 March each year, the operator will have to surrender a number of allowances equal to the emissions of its installation in the preceding calendar year. The Directive would set harmonised penalties to be paid by operators for not surrendering a sufficient number of allowances. In the period 2005-2007, the Member States shall allocate allowances free of charge according to a national allocation plan to be approved by the Commission and respecting certain criteria so as to avoid state aids and distortions of competition between sectors in different Member States. For the 2008-2012 period, the Commission shall specify a harmonised method of allocation at a later stage.

Member States will set up national registries to ensure the accurate accounting of the holding and transfer of allowances, and the Commission will designate a Central Administrator at Community level to keep an independent record of allowances. The Member States shall report to the Commission every year on the implementation of the Directive. The Directive will also set principles for the monitoring and reporting of emissions from installations, on the basis of which the Commission intends to adopt more detailed guidelines at a later stage, as well as criteria for the verification of the operators' reports.

Acknowledging the considerable interest in emissions trading, Commissioner Wallström emphasised:

"The Proposal on emissions trading represents a major innovation for environmental policy in Europe. We are de facto creating a big new market, and we are determined to use market forces to achieve our climate objectives in the most cost-conscious way. For the market to operate properly and deliver environmental benefits we must create the necessary structures."

She added: "Emissions trading will play an increasingly important role over coming decades when we will extend it to other sectors and greenhouse gases. Our system will also be fully compatible with the emerging international emissions trading system. But, as a first step we must establish confidence in a system that is shown to work, with adequate controls."

Mrs Wallström concluded: "I am very satisfied to see this package of measures on climate change adopted by the Commission today. The ratification proposal will bring us closer to entry into force of the Kyoto Protocol by 2002. The emissions trading proposal shows how we intend to fulfil our commitments by using new instruments. The Communication is important in emphasising that the EC does not intend to meet its Kyoto commitments by concentrating on any one measure or sector, but to take action simultaneously on a broad range of fronts. I now expect the Council to adopt our proposals rapidly time is running."

Background:

The Commission has presented its proposals for ratifying and implementing the Kyoto Protocol just two weeks before the 7th Conference of the Parties to the UN Framework Convention on Climate Change ("COP7") will be held in Marrakech from 29 October to 9 November 2001. The objective of this conference is to translate the political agreement on the main outstanding issues concerning the implementation of the Kyoto Protocol that was reached at the resumed 6th Conference of the Parties in Bonn last July into legal text. The EU is confident that this aim can be achieved if all Parties stick to the Bonn agreement. Following the United States' withdrawal from the Kyoto Protocol announced by President Bush in March, the entry-into-force of the Kyoto Protocol requires its ratification by a broad range of other industrialised and developing countries, including the Candidate Countries, Russia and Japan. By presenting its proposal for an early ratification of the Protocol, the Commission hopes to convince other Parties to follow suit rapidly.

Combating climate change is also a priority under the Community's 6th Environmental Action Programme and the EU's sustainable development strategy endorsed by the European Council in Göteborg in June 2001. The EU's heads of state and government at the time re-iterated the EU's determination to meet its commitments under the Kyoto Protocol and to ratify the Protocol so as to allow it to enter into force by 2002.

In the meantime, the EU has reduced its greenhouse gas emissions by 4% between 1990 and 1999 and is thereby on track to meet its commitment under the UN Framework Convention on Climate Change to stabilise its emissions at 1990 levels.

References

[1] COM(2000) 769.

[2] COM(2001) 370.

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The Danish Emissions Trading Scheme.[26]

Eva Jensen, Danish Energy Agency, Copenhagen, Denmark

Keywords. Emission trading, flexibility instruments, Kyoto Protocol, climate change

Abstract. This paper presents the Danish emission trading scheme and how it functions. First of all, some background is given to the emission trading scheme, especially concerning the Danish commitments for climate protection. The trading scheme is described in detail, including its implications for other energy policy. The EU notification of the trading scheme is then described, how it has started and what Denmark expects later from the scheme, in particular in an international perspective.

Danish commitments

Danish GHG targets

Denmark has the following three targets for the protection of climate change:

- UN's Climate Convention and EU: -5% CO_2 emissions in year 2000 compared to 1990 (the EU as a whole has a stabilisation target)
- National Target: -20% CO_2 in 2005 compared to 1988
- Kyoto and EU bubble: -21% GHG's in 2008-12 compared to 1990 (which is considered a fairly hard target for Denmark)

Background for commitments

What is the background for starting a trading scheme?

- First of all, there is a high environmental responsibility of the Danish society due to:
  - Large reduction potential
  - High per capita emissions
  - High per capita income
- Second, there is a high degree of security of supply (or negatively spoken: of overcapacity):
  - 160-180% power production capacity (older coal plants for which Denmark wanted to make sure that they are not used for exports when electricity prices go up on the market)
  - Denmark is a net exporter of oil and gas
- Third, there are also industrial interests
  - Denmark is a "First mover" on wind power and biomass and wants to push these technologies further on.

Results of past efforts

Denmark has made considerable efforts for climate protection in the past. Achievements to be mentioned by are that

[26] Transcription of the oral presentation by E. Jensen.

- 50% of heat consumption is covered by district heating
- 75% of district heating is covered by CHP
- 50% reduction in heat consumption pr. square meter (since 1972)
- 50% increase in consumption of renewables (since 1990)
- Denmark covers half the world market in wind turbines

Danish CO_2 emissions and export of electricity

As already mentioned, one motivation for introducing a trading scheme was to prevent the export of electricity from coal-fired power plants. Figure 1 shows the Danish CO_2 emissions (green line). It appears clearly that the emissions follow the blue columns of electricity exports. To fulfil it targets, Denmark has to be sure that there will not be too much export of electricity.

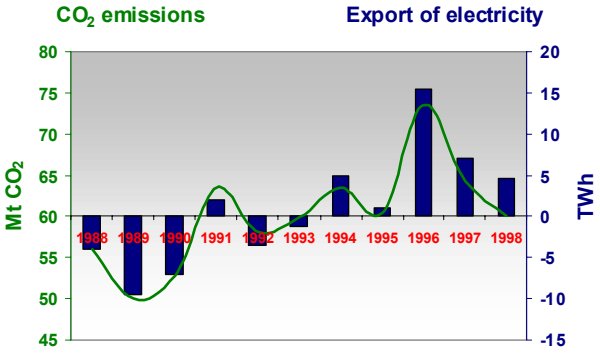

Figure 1. Danish CO_2 emissions and export of electricity

Danish CO_2 cap and trade scheme

How does the Danish cap-and-trade system work?

- First there is a limit on the CO_2 emissions for each year
- The scheme was designed to preserve the possibility of participation in the Nordic market for electricity (but by excluding too much of coal-based electricity exports)
- It should give incentives to produce electricity by more environmentally friendly technologies
- It should prepare the energy sector for the use of the Kyoto mechanisms
- The period envisged are the years 2000-2003

To start with the cap: allowed emissions by the power sector are for the different years:

- [Year 2000: 23 Mtonnes CO_2]
- Year 2001: 22 Mtonnes CO_2
- Year 2002: 21 Mtonnes CO_2
- Year 2003: 20 Mtonnes CO_2

The figures for 2000 are in brackets because the system was delayed due to the approval procedure of the EU, and the system could not start in time. The system started only in January of 2001.

One could ask whether this is a stringent target. This question might be answered by looking at the average emissions from the power sector which for the period 1994-1998 were on average 30.3 Mtonnes CO_2 (though this figure includes the large electricity exports in that period). Covered by the scheme are power companies with emissions of more than 100 ktonnes CO_2/year (see also next section), or

- 90% of emissions by the power sector
- 85% of power production

The allocation principle is Grandfathering to companies already producing power (+ Vattenfall), based on average historical emissions in 1994-1998. There are two reasons for this choice. First of all, the producers who invested in capacity did not know that the scheme was going to come. The second reason was that the companies have to compete with other countries, and in this case the Grandfathering is politically more acceptable than the auctioning out, which in theory is more attractive.

The last part of the scheme is a penalty/tax: 40 DKr/tonne (~ US$ 5). This is fairly low. The reason for this was again to prevent that Danish companies would be disadvantaged compared to companies in surrounding countries which do not have a cap. Even if the penalty is low it was calculated to ensure compliance.

Emissions trading players

Currently, the emission trading players are 8 companies, of which the first two are the largest ones:

- Elsam (Western Denmark)
- E2 (Eastern Denmark)
- PreussenElektra / EON
- Vattenfall
- Østkraft, Randers Kommunale Værker
- Shell
- Christiansø, Anholt

Anticipated implications

What will be the implications of the scheme?

- The Nordic reserve capacity will be limited
  - Marginal production costs will rise significantly (by 30%)
  - Clean technologies will become more competitive
- The fulfilment of Danish commitments will be supported
- Only few traders and trades initially
  - BUT the scheme is prepared for international participation!!!

It should be added that there is not only a cap but also a banking cap.

Further, it should be mentioned that the scheme is also prepared for participation in CDM and JI. It makes provisions for these flexibility instruments so that the ministry can issue guidelines on participation in CDM and JI without going through the whole legislative process again. However, this could only be done when international guidelines become available and Denmark has to wait until then. The position of Denmark is that these projects should be based on the "polluter pays" principle, i.e. the industries should provide the funds for these projects.

EU notification

The trading scheme has been notified according to the directive on state aid. There were three key questions to which answers had to be provided before notification was given:

1.Equal access Set aside (declaration)

This was considered a problem in particular for new entrants into the market though this is very unlikely in the next years: first new entrants have to build up new capacity which takes years and second, the price is so low currently that nobody invests in production capacity in Denmark. So the compromise was that the Commission in is approval proposed that if any new entrant will come in, he would be provided with reduction units. Denmark promised to do so.

2.Element of subsidy Stringent targets

Then there was the element of subsidation which arises due to the choice of the grandfathering. The question was whether this was state aid, as no auctioning was carried out. However, the answer was very clear: as Denmark was the only country with targets, it is not considered as state aid. As long as other countries have no such schemes, this is not problem. However, in the future, when other schemes will arise, we will have to come back to this question.

3. CHP-protection Supports environmental aim of the scheme

This was a minor item, which will not be further discussed here.

How is the scheme working in practice? So far, there is still little experience as the scheme started late. There have not been any trades yet. For the moment only simulations of the trade are available up to 2006. By the end of this year, the Danish government would have to decide on the quotas further on up to 2006 so that the companies would have a firm ground for their decisions. Another crucial element in the simulations is the price of electricity which starts quite low (around 12 Danish Ore) to end up to rise to about a Dollar at the end of the period. At the beginning there will be little electricity production (due to the low electricity price) and companies will bank. In 2003/2004 the emissions will be higher than the cap, and the companies will empty the bank and at the end the emissions are higher than the quota and nothing will be left on the bank . Companies will then start paying for the emissions.

In summary from international perspectives and considerations the following elements are important with the trading scheme:

Cost effectiveness	⇨	Trading needed
Trade implications	⇨	Auctioning preferable
Political reality	⇨	Only "Grandfathering" acceptable
Risk	⇨	Trading and GHG reductions never a reality

Further Developments

The following developments in the near future might occur with the trading system:

- The period after 2003 will have to be figured out (will there be a cap and if yes, how low?)
- How to enter more sectors/more players (energy-intensive industries)
- Adjustments of tax/penalty as others follow (for example in the frame of a general Nordic trading scheme, though this is not very concrete yet)
- Development of the market place (currently a formal platform for such a trading scheme which is Internet based, is elaborated by international consultants).
- Distribution of emission permits (especially when new producers enter the market, will there still be Grandfathering?, although new entrants are not expected before some time. Then there will be the EU trading scheme to be considered.)
- Developments of JI and CDM: as soon as international rules are available, the Danish scheme will be opened to this. Electricity industry is currently pushing much into that direction.
- Green certificate market (2003): 20% of the market should be covered by green electricity. Compatibility with the trading system needs to be assured.

References

Web site of the Danish Energy Agency: www.ens.dk, English/Electricity reform/Bill no. 235 on CO_2 Quotas for Electricity Production

The Proposed UK Emissions Trading Scheme.

Margaret Mogford, UK Emissions Trading Group Secretariat

Abstract. The purpose of this paper is to develop general thoughts about carbon trading and the Emissions Trading Group (ETG) process and provide an overview of the proposals for a greenhouse gas trading scheme and the prospects for successful implementation.

Why emissions trading?

The arguments for emissions trading are well understood. When accompanied by a robust compliance and reporting regime, trading delivers assured environmental results as reliably as regulation but it does so in a way that works with business instincts rather than against them. A market acts as its own check on compliance. It is unlikely that a firm will cry foul if a competitor appears to be getting an easy ride from an inspector but you can be sure that there will be complaints if there is suspicion of market advantage from weak verification of emissions.

Having said that we must be clear, trading itself does nothing for the environment. It is merely a delivery mechanism, that directs investment and changes of operating practices, which are the means of improving environmental performance, to where they can be most effective.

Businesses become fully engaged when trading is allowed to meet an environmental target, from the plant manager to the commercial analyst. It achieves what environmental managers have been attempting for years, bringing environmental concerns to the centre of business decision making. The collaborative effort of the ETG where some 100 companies and other organisations came together to work with government to design the system, demonstrates the business interest in trading as an environmental tool. This compares with development of Integrated Pollution Prevention Control (IPPC) and even the Climate Change Levy (CCL) negotiated agreements where business did not feel engaged in the fundamental design.

Why Carbon Trading?

Emissions trading works where the impact of the pollution is not specific or localised. The wider spread the impact the larger the potential market, and the larger the market the more efficient it will be in discovering least cost abatement opportunities. Greenhouse effects are the ultimate non localised pollution impacts. The effect on the atmosphere is independent of the source of the emission. This makes greenhouse gases ideal emission trading pollutants for their greenhouse warming potential, it does not over ride the local air quality impacts of the non CO_2 gases which remain controlled under IPPC.

Greenhouse gases are recognised internationally as a threat and, notwithstanding the outcomes at the Hague, the building blocks are in place for world wide trading with all the economic efficiencies that that will bring. It is also clear that Kyoto is only the beginning. As the demands on business get tougher it becomes all the more important that economically efficient solutions are found.

Meeting the demands of stabilising 550 ppmv CO_2 in the atmosphere will, according to the Royal Commission on Environmental Pollution, require a 60% cut in UK carbon emissions by 2050. This will not be achieved without a transformation of the UK economy. History shows that economic transformation occurs in response to market signals rather government direction. Emissions trading will play a critical role in signalling and encouraging the necessary changes in the economy, whether by generating extra revenue streams for low carbon technology or by pricing high emissions sources out of the market. The value of the carbon emissions associated with investments will be factored into those investment decisions. In economic terms former free externalities will be internalised. With the right market signals the transformation should be made with less dislocation than would occur under other approaches.

What is the Emissions Trading Group?

The ETG is a collaboration of companies, trade associations, service providers and critically government departments that came together because they believed the arguments on the value of emissions trading as an effective tool to deliver carbon emissions reductions from UK business.

There are multiple motivations for being involved in the ETG but the common belief is that climate change is a real problem and that businesses will have to play a part in delivering the solution. We in the ETG do not compare the business impact of emissions trading with past business as usual without climate change policies, it is self evident that such policies are here already and will get tougher; the CCL is the best example. We are working to show that business is willing to collaborate with government to design policy tools which allow business to contribute with less deleterious effects on competitiveness.

The ETG was formed in June 1999 under the auspices of the CBI and the Advisory Committee on Business and the Environment by some 30 major companies and other organisations. All companies are represented in the ETG Council by board level individuals, signalling high level engagement in the process, to stop staff like myself getting involved for intellectual interest without evident support of the company. The work is done by technical level representatives of the companies in work and advisory groups. Critically our government colleagues have been represented at all meetings of these groups so that ideas are worked out with government. When our papers are delivered to government, they hold no surprises indeed they have been instrumental in their writing.

The numbers have now grown to 100, with new companies coming on board all the time. We have full participation of big five consultancies, banks,

City law firms as well as brokers, verifiers and other service providers all of which bring expertise necessary to a workable design.

An important element of the process is the external outreach, both to firms that do not have the resources to be actively involved, via a series of workshops in London and the regions, and to other stakeholders. The CBI organised introductory workshops in Spring 2000 in 10 locations attended by over 400. These were followed up by another series in the New Year with a similar attendance.

Equally important has been the NGO liaison Group that has met regularly for over a year to test the ideas we are developing against an NGO review. These meetings have been good economic tutorials on the principles and practicalities of the scheme. As a result the scheme design is strengthened and we have gained the support of NGOs to the principle of trading so long as

- it delivers real environmental improvement,
- is subject to robust monitoring and verification and
- is transparent;

principles that underpin the work of the ETG. As they point out and we would agree, the issue of the setting of targets may not meet such a consensus.

Why has the ETG worked as a process?

The ETG has worked for the same reasons as an emissions market will work. It works with the grain of business and government needs. There is remarkable alignment between the government wish to be assured of emission reductions and the business view that how and where to find those reductions should be left with them.

The ETG as a process has worked for several reasons among them:

- Participant companies have nominated very senior people to the Council from which the Steering Committee has been drawn. The Steering Committee has main board members of some ten companies and CEOs of some, under the chairmanship of Rodney Chase, deputy CEO of BP. Such high level engagement of the companies demonstrates commitment and allows those working on the scheme to devote considerable time.
- The hard work of those that have actively participated. Some have given days of work per week since the ETG was established. The thinking and solutions have emerged from workgroups and advisory groups chaired by representatives from different ETG members. The chairs look for volunteers to work on papers individually and in small groups, and that work has always come through. The quality is high and often on particular subjects, for example the measurement of baselines for projects, we have assembled UK expertise and by pulling such a broad group together we take the topic forward. In other areas we have developed new ideas and even vocabulary, for example in relation to accounting for emissions from electricity, we have distinguished between double counting and discrepancy, a technical but very important step to clarifying thinking on a difficult subject.
- The true collaborative nature of the process is exemplified by the Secretariat, which is staffed by secondees from BG, a gas exploration and distribution company, from the DTI and from BP and is housed at Blue Circle, the cement company. This demonstrates the range of interests within the ETG.
- The achievement has not just been from hard work but because of the commitment and enthusiasm that being involved in an innovative policy development process and working with new ideas brings. There are business reasons for us all to be involved but the narrow business interests are often left at the door in the search for workable solutions.
- Finally, critical to the process has been the full engagement of government. The openness and co-operative approach of officials from DETR, DTI and Treasury has greatly improved the quality of our proposals but also enhanced their acceptability to government.

What has the ETG achieved?

So what has all the hard work and enthusiasm for the project achieved? In a sense nothing yet, we still await an operational trading scheme in the UK. On another level, the achievement has been extraordinary. We have developed a blueprint for a trading scheme that will fit with existing climate change policies and measures in the UK. We have influenced the debate on company emission trading throughout the world, even adding new words to the lexicon, such as ‘gateway’. We get enquiries from as far away as Japan and Australia and the proposals were presented in The Hague to a packed side bar meeting.

We have offered the solutions to problems that will beset introduction of emissions trading in many other countries, such as whether a voluntary approach can work, how to handle energy efficiency targets and whether a scheme can encompass electricity users and producers. Our ideas on these and other issues will not necessarily be adopted but they will influence thinking. It is for this reason that many international firms that will service international emissions trading are so closely involved in our group. There are risks with being in front of the game and the influence being a front runner brings also carries responsibilities to do our best to find the right solutions. Having said that, we are prepared to say the trading system will be an exercise in learning by doing, we cannot expect to get it right from the first.

The actual outputs that we can point to are the Outline Proposals published in March 2000 and the reports of the advisory groups that have been meeting

since then. All these are on the ETG website which now has over 500 regular users.[27] Following the clear instructions from our steering committee these do not dwell on theory or concepts but tackle the practical issues of designing the scheme.

A critical success without which the scheme would not proceed and which has attracted much interest overseas, is the case we made to government for a financial incentive for firms that take on and deliver a binding and demanding emission reduction target. We were able to win the argument on efficiency grounds that are fundamental to the case for trading, that is that the market will find the least cost abatement options. It therefore follows that incentives to firms with the opportunity to trade to meet their targets will deliver very good value emission reductions.

The ideas proposed by the ETG were well received by government, both in letters to the Steering Committee chairman and in statements in budget and pre-budget reports but the first full commentary on the proposals came in November 2000 with the publication of the DETR consultation document on the trading scheme[28]. Most of the document is very familiar to those that have been working in the ETG. It does depart from ETG proposals in one or two places, for example in the preference for a three year average to set the grandfather baseline but it is a very fair reflection of the work that has been done and it asks good questions about the design.

Is a successful ETS assured?

The short answer is no. There is still a great deal to do on the technical infrastructure for the scheme,

- Designing and building a registry to track and hold allowances
- Accrediting verifiers
- Agreeing reporting protocols
- Writing the detailed rules and the designing and operating incentive scheme

Much of this activity lies with government but with the political will that has been shown to date, we must assume that sufficient resources will be directed to these tasks and that they will be in place in time.

More of a risk lies on the company side. It is possible that there will be too few volunteers for the scheme, because of

- lack of awareness,
- inability to prepare, by understanding company abatement costs and future emission profiles
- undue complexity of the scheme
- finally a new risk since The Hague, that senior managers in UK firms take the message from the failure to reach agreement that the rest of the world is not moving forward so that voluntary action here would be unnecessary and pointless.

It is important, if we are not to waste the work that we have put in that these risks are overcome, by extensive marketing of the scheme, full engagement of the service providers in raising awareness but most important continued full and widely expressed support from government.

It will remain however something of a leap of faith for firms to commit to the scheme. They will be voluntarily taking on a binding limit on their emissions for the period of the scheme. Despite the incentive, this decision may not be primarily a financial decision, it will be about

- corporate reputation,
- demonstrating faith in a policy tool that we believe to be better than regulation or tax
- gaining early experience in a carbon market which will come and which will be significant and word wide
- benefiting from the discipline that a market brings to understanding carbon costs and abatement opportunities.

So what should we expect

I think that we can confidently see a greenhouse gas market in the UK with a few brave early trades from April 2001 but with firms with caps in place from January 2002. They will be pioneers and they will not be many but there is enough momentum behind the scheme that there will be sufficient for a market to be established. There will also be a large potential market for permits in the negotiated agreement sector, which numbers some 5000 firms.

Assuming that there is real progress on the international front and that the UK market in year one functions effectively, in the following years there will be a rush to participate. It takes much less courage to join a market, where prices are beginning to emerge than to create one from scratch. The attractions will be evident to a much wider range of firms.

For business as a whole the prize is significant. It is in business' interests to demonstrate a better way of delivering emission reductions than the alternatives and a better, collaborative approach to developing new policies in relation to business.

[27] http://www.uketg.com

[28] A Greenhouse gas trading Scheme for the United Kingdom, November 2000, DETR, London

The European Greenhouse Gas Tradable Emission Permit System: some policy issues identified with the POLES-ASPEN model.

Patrick Criqui and Silvana Mima, Institut d'Economie et de Politique de l'Energie.[29].

Keywords. CO_2 emission reduction, tradable emission permit system, partial equilibrium model, energy sector model, environmental regulation, energy intensive industries, electricity sector, economic effectiveness.

Abstract. This paper provides some insight on the issues raised by the *Greenhouse Gas Tradable Emission Permit System (TEPS)* proposed in a Green Paper of the European Commission in 2000. It is based on the results of the POLES model for the simulation of the *Marginal Abatement Cost* curves of the EU countries and on the ASPEN software for the assessment of the corresponding structure of the permit market. The first section identifies the issue of the national sectoral entitlements, in the context of the European burden sharing agreement, and then derives a simple scheme for the CO_2 entitlement of energy intensive industries and electricity sector; this system is based on the hypothesis of entitlements allowing for the equalisation of the *marginal abatement costs* (MACs) across the different sectors of each country. The second section presents and discusses the key outcomes of the simulation for the energy intensive industries and electricity sector TEPS in 2010. The third section discusses the consequences for industries of different environmental regulation schemes, while comparing the grandfathered and auctioned permit system with the tax or technical standard *(Policies and Measures)*. It also identifies some key issues that will have to be further analysed and discussed in the process of designing the EU emission permit market.

Introduction

In 2000 the European Commission prepared a *Green Paper* on the creation of a *European Greenhouse Gas Tradable Emission Permit System* to be implemented from 2005 on, in a perspective of early action for the compliance to the Kyoto Protocol. This proposal was issued in order to allow for reactions of industry, stakeholders and academic researchers, before further elaboration by the EU services. The exercise performed with the POLES model and the ASPEN software shows that such a TEPS for large energy consumers in Europe would bring large economic benefits, compared with the no-trade situation. It also shows however that this type of tradable permit system supposes first that the thorny issue of sectoral entitlements is solved in a satisfactory way both inside each country and across member countries.

The European Commission Green Paper on emission trading

The Green Paper presents the main lines of a future European emission trading system for the electricity sector and the energy intensive industries, i.e. the industries identified the Large Combustion Plants and Integrated Pollution Prevention and Control Directives. The proposed scheme would start in 2005 and thus be incorporated in an *early actio*n scheme for the compliance to the Kyoto Protocol. But it is also proposed that the market may be progressively extended to other industries and economic actors and thus constitute the core of a future EU-wide tradable emission permit system. It is thus important, in view of these possible developments, to identify the key issues raised by the definition and implementation of such a scheme. The key issues of course relate basically to questions of economic effectiveness on one hand, and equity and competitiveness on the other hand.

The POLES model for the simulation of MAC curves

The POLES model is a partial equilibrium, energy sector model for the world up to 2030. Its geographical and sectoral disaggregation (30 countries or regions in the version used for this exercise, about 12 sectors of activity and 24 power generation and renewable technologies) is however sufficient to provide insights on the potential impacts of energy and environment policies at a country or regional level and, in the case of this study, for Europe.

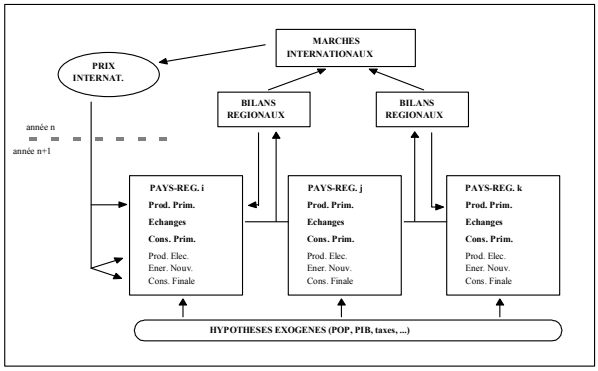

Figure 1. The POLES model dynamic simulation process

Basically the POLES model simulates energy and environment policies through the introduction of a shadow tax for the considered emissions. In the case of CO_2 emission reduction policies, the *shadow carbon tax* is introduced in every module where fossil fuels are burnt, proportionally to the carbon content of the fuel. This shadow carbon tax can indeed represent either a carbon tax, the price of an emission permit or also the dual cost of a technical standard or *Policy and Measure* (P&M). We thus denominate it with a generic term: the *Carbon Value*, which represents the value given by society to the reduction of 1 tC of emissions.

By performing a series of simulations of the model with stepwise increases in the Carbon Value, it is possible to simulate the corresponding reductions in emissions and to associate a price/cost with a quantitative reduction target: this allows to build the Marginal Abatement Cost curves for CO_2, which can be identified at the sectoral or national level.

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The ASPEN software for the analysis of tradable permit systems and emission reduction policies

The ASPEN software then uses the MAC curves produced by POLES as inputs for the simulation – on simple but robust micro-economic grounds – of Tradable Emission Permit Systems. The principle used is the one of cost-minimisation through trading: if a set of economic actors – be they world regions, countries or sectors, each characterised by its own MAC curve and emission constraint – participates in an emission permit market, then the price of the permit will equalise, through the process of exchanges, the Marginal Abatement Costs for each participant.

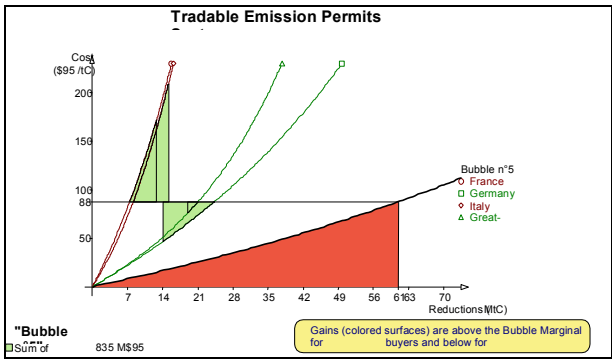

Figure 2. Example of a permit market simulation with the ASPEN software

The ASPEN software allows to calculate the marginal and total abatement costs with and without permit system and also to evaluate the *gains from trade* for different extensions and structure of the market. This process can be applied either for the assessment of international emission reduction agreements or for the analysis of national policies involving different sectors with different MAC curves.

A starting point: national emission reduction policies and sectoral CO_2 entitlements

The design of CO_2 emission reduction policies can be based on different policy instruments such as Carbon taxes, Policies and Measures or tradable emission permit systems. Very probably the implementation of actual policies will rely on a mix of these different instruments, according to the characteristics of the different sectors considered (number of economic agents, respective sensitivity of these agents to price signals …).

One key issue in the definition of national policies is the "inter-sectoral equity vs overall economic effectiveness" trade-off. Each type of instrument – P&M, tax or tradable permit – will allow for emission reductions, be it with or without an explicit quantitative target, but it will also involve additional sectoral costs. Thus the policy mix considered in a national policy also corresponds to an explicit or implicit carbon entitlement and to a burden-sharing of the national target among the different sectors.

This question is rarely addressed as such and it raises difficult policy issues, similar to those of the identification of acceptable quantitative emission reduction objectives in an international agreement. Two extreme approaches can be adopted in the design of a national emission reduction policy and in the identification of the corresponding sectoral targets:

- In the case of the adoption of a *general carbon tax* (GCT) system, the emission control is obtained by a price signal. In principle, the same tax introduced in every sector will induce the implementation of all abatement options that present a cost inferior or equal to the tax level. As a consequence, marginal abatement costs are equalised across the sectors. The global target is met with full economic-effectiveness, provided that the level of the GCT has been conveniently determined.. The sectoral targets, total sectoral costs and share of the burden are not identified ex-ante but can only be studied ex-post, after the MAC equalisation process. To some extent, the sectoral equity or fairness of the policy do not even have to be considered in the first stage of the policy process.
- But a different approach may also be adopted through a *uniform reduction objective* system. This is done by considering a uniform limitation or reduction rate relatively to the base year that is equal to the national objective; i.e. if a country has to reduce its emissions of x% relatively to 1990, then this objective is applied in each sector. Of course the corresponding sectoral targets allow to meet the national goal and the advantage of this system is that it *apparently* provides a fair burden-sharing among sectors. This may however not be the case if, as maybe expected, the trends in emissions in the no-climate policy scenario and the MAC curves are very different across sectors.

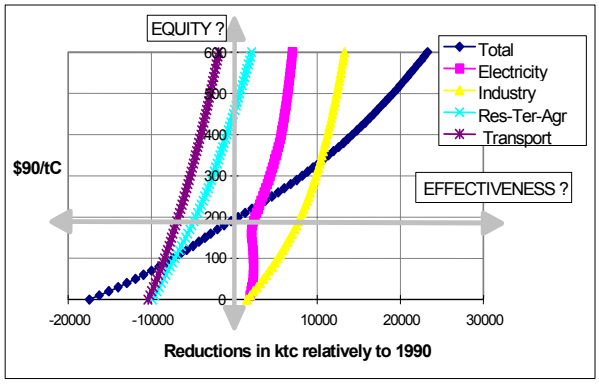

Figure 3: Sectoral targets for France, equalisation of MACs with a carbon tax vs. uniform reduction objective (0% increase between 1990 and 2010)

The potential consequences of such a *uniform reduction objective* can be analysed and compared with a general carbon tax system while considering, as a simple example, the set of sectoral MACs produced for France with the POLES model and illustrated in Figure 3.

This case clearly shows the differences in marginal and total costs, incurred by the sectors in the *general carbon tax* versus the *uniform reduction objective* policy: in the former case the MACs are equalised, but some sectors (industry) reduce their emissions more than others (transport), in absolute and in relative terms. In the latter case, all sectors stabilise their emissions, but the MAC is null in industry as this sector already reduces its emissions in the No-Policy Case, while it would be rocketing in the transport sector, which presents both a high Reference and a low price-elasticity to the Carbon Value. The case of other European countries may be less easily illustrative, but this only for technical reasons (reduction targets should be differentiated in a Figure 3.-type representation), while the essence of the problem remains unchanged.

A third type of policy may reconcile the two approaches by entitling the different sectors according to the uniform reduction objective and then install a nation-wide trading scheme, allowing for the equalisation of sectoral MACs. The distributive consequences of such a scheme would of course be very important, with some sectors being sellers and the other buyers of permits. As mentioned above, actual policies will probably use a mix of instruments and thus follow a hybrid sectoral entitlement scheme.

As no explicit and general rule has up to now be identified either at a country or EU level, one difficulty for economic modelling exercises is to build reasonable hypotheses on sectoral entitlements. In most cases the hypothesis is that of entitlements according to the equalisation of sectoral MACs: it indeed allows to suppose that the cost-effectiveness criteria is respected in the design of national policies and this is its main advantage. But, as underlined above, this hypothesis is not the only one possible and, to some extent, it may even be considered as a "modelling artefact".

A EU trading scheme for industry, under the "equal MAC entitlement" hypothesis

For exploratory purposes, the EU trading scheme for energy intensive industries and the electricity sector has been explored with POLES and ASPEN under the hypothesis of European burden sharing agreement and "equal MAC national entitlement" in each EU country or region. Furthermore, it has to be underlined that this hypothesis corresponds to a certain degree of *grand- fathering* as the entitled emissions are given for free.

The no-trade and EU-wide trading cases as benchmarks for analysis

The Kyoto compliance hypothesis is first studied for the EU in 6 regions (Germany, France, Great-Britain, Italy, Rest of EU-North, Rest of EU-South). The results in Table 1. show that under the European burden sharing agreement with no-trade hypothesis, the national MACs measured by the POLES model lie in a very wide range, from 16 €$_{99}$/t CO_2 (52 $$_{90}$/tC in Germany) to 118 €$_{99}$/t CO_2 (in Rest of EU-North). The total cost for the EU is of 17 b€$_{99}$, i.e. approximately 0.17% of EU's 2010 GDP. The theoretical hypothesis of a full perfect market at EU level changes the scene quite drastically, with a permit price of 42 €$_{99}$/t CO_2 and a total cost of 11 b€$_{99}$. This case is however highly hypothetical, as it supposes the possibility of a market to be established among very different sectors, some of them made of a multiplicity of economic agents.

Table 1. The Kyoto Protocol in the EU, costs in the EU-wide Trade and No-Trade cases

	Emissions (MtC)			Trade: Permit Price 134,5 $/tC					No Trade		
KYOTO 2010	2010 Ref (Mt)	2010 Kyoto (Mt)	2010 Trade (Mt)	Trade (Mt)	Trade Value (M$)	Dom Cost (M$)	Total Cost (M$)	%of GDP	MAC ($/tC)	Cost No Tr (M$)	%of GDP
FRA	121	104	108	-3.5	468	796	1 265	0.08	*165*	*1 350*	*0.09*
RFA	236	210	182	28.0	-3 760	3 167	-593	-0.03	*52*	*643*	*0.03*
ITA	123	103	111	-8.6	1 151	715	1 866	0.13	*279*	*2 454*	*0.18*
GBR	168	141	137	4.4	-585	1 800	1 215	0.09	*108*	*1 274*	*0.09*
RELn	206	146	174	-28.5	3 828	1 835	5 664	0.40	*381*	*8 763*	*0.62*
RELs	131	112	104	8.2	-1 102	1 563	462	0.04	*83*	*680*	*0.07*
Total Bubble	983	816	816	(40,5)	(5447)	9 877	9 877	0.11	-	*15 164*	*0.17*

The energy intensive and electricity sector market

The EU Green Paper on emission trading introduces some realism in the scenarios for emission permit trading in Europe and this is already a major achievement. It is indeed supposed that the market may be progressively introduced, first in sectors built from large energy consuming entities, i.e. the energy intensive industries (EII in Table 2.) and the electricity sector (ELEC).

The simulation of such a market with POLES and ASPEN, supposing that each sector's entitlement correspond to the equalisation of the MACs *at the national level* shows that this initial market would indeed capture quite a large part of the gains that would be obtained in the much less realistic case of a full EU-wide trading scheme.

Table 2. The EU industry and electricity sector market, costs in the Trade and No-Trade cases

	Emissions (MtC)			Permit Price 123 $/tC				No Trade	
EU Buble 2010	2010 Ref (Mt)	2010 Kyoto (Mt)	2010 Trade (Mt)	Trade (Mt)	Trade Value (M$)	Dom. Cost (M$)	Total Cost (M$)	MAC ($/tC)	Cost No Tr (M$)
FRA-ELEC	9	8	8	0.3	-39	28	-12	*(37)*	*11*
FRA-EII	9	8	9	-0.4	53	47	100	*185*	*113*
RFA-ELEC	63	50	38	12.0	-1 479	1 345	-134	*52*	*325*
RFA-EII	14	13	13	0.9	-108	94	-14	*52*	*17*
ITA-ELEC	31	23	27	-3.4	422	235	657	*279*	*911*
ITA-EII	9	7	8	-1.2	142	58	200	*279*	*287*
GBR-ELEC	46	31	30	1.2	-143	801	658	*108*	*666*
GBR-EII	10	9	8	0.1	-18	81	63	*108*	*64*
REUn-ELEC	46	24	34	-10.1	1 247	642	1 888	*380*	*2 987*
REUn-EII	18	12	16	-3.7	459	127	586	*380*	*1 031*
REUs-ELEC	39	28	25	3.9	-474	795	322	*83*	*401*
REUs-EII	9	8	7	0.5	-61	113	52	*83*	*63*
Total Bubble	304	221	221	(18,9)	(2322)	4 364	4 364	-	*6 877*

The key results in Table 2. indeed show the following:

- The intensive industries and electricity producers market covers approximately 30 % of the Un-

ion's emissions (given the POLES model sectoral disaggregation).

- The gains that may be expected from the trade among these sectors amount to 2.85 b€$_{99}$, i.e. about one half of the total gains from trade (in the full EU-wide vs. no-trade cases).
- The price of the permit is of 38 €$_{99}$/t CO_2, slightly inferior to the hypothetical EU-wide Carbon Value.

With the national entitlement system considered here (equal sectoral MAC in each country) the trade flows in the European energy intensive industries and electricity sector market principally consist in:

- Purchases from the electricity sector and energy intensive industries in EU-North (respectively 10 and 4 MtC) and in Italy (3 and 1 MtC).
- Sales from the electricity sectors in Germany (12MtC), Great Britain (1MtC), EU-South (4MtC).

All participating units benefit from the emission permit market. In the four importing units identified above, the gains come from a permit price that is inferior to the national carbon value. For the three exporting units the permit price is higher than the national carbon value, but further reductions are more than compensated by the permit sales revenues.

A particular situation occurs in France, where the electricity sector presents a backward bending MAC curve for intermediate carbon values. This is explained in the model's results by the following phenomenon: when the carbon value is low, the electricity sector's emissions are reduced; when it increases further, electricity – which presents in France a very low carbon intensity because of the nuclear share in power generation – replaces more carbon intensive fuels in final consumption, but as a consequence, the emissions of the power sector increase; then for high carbon values the effect is again a net reduction in the electricity sector. This type of situation should clearly deserve more analysis in terms of the complex indirect effects of a carbon value on the fuel mix and sectoral emissions.

The total cost for industry and the issue of the entitled vs. auctioned permits

It has been supposed in the above analysis that the permits have been initially entitled to the different sectors according to the MAC equalisation rules. In that case the total cost for the sector is the one indicated in Table 2. It corresponds solely to the cost of the abatement inside the sector plus or minus respectively the buying or sale of permits for the difference between the entitlement and the effective emission.

Policy instruments and total cost for industry

Figure 4. illustrates in a generic way the possible elements of the total cost for a sector, in a buyer case (i.e. when the marginal abatement cost in the no-trade situation is higher than the permit price in the trade situation) and for four types of policy instruments:

- In a no-trade + Policy and Measure (or emission standard) the total cost is only the sector abatement cost (A+B1+B2).
- In a no-trade + carbon tax system the total cost is the sum of the sector abatement cost (A+B1+B2) plus the tax paid on remaining emissions (C1+C2).
- In a trading case + entitled or grandfathered permits, the total cost is limited to the sector abatement cost (A) – which is of course lower than in the no-trade situation as the permit market allows to lower the required MAC – plus the permit purchase (B1).
- In a trading case + auctioned permits, the sector cost is the sum of the abatement cost (A), plus the costs of the permit corresponding to the total emissions (B1+C1).

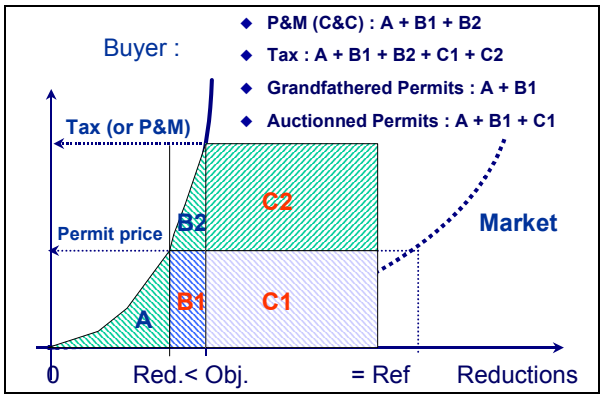

Figure 4. Total cost for a sector for 4 types of policy instruments (buyer case)

This type of analysis allows to identify the similarities in terms of cost structure between the P&M system and the entitled (or grandfathered) permit market on the one hand, and the carbon tax and auctioned permit on the other hand. It also provides an insight on the possible preferences of industrialists as regard the choice of the policy instrument. In the case of a buyer, examined here, the carbon tax is systematically the highest cost solution and the entitled permit the lowest one. The comparison between the Policy and Measure and the auctioned permit systems depends in the industry's perspective on the relative surface of B1 and C1, i.e. of the Reference, the permit price and the MAC curve shape.

For concision's sake a similar analysis for the seller case is not provided here. It would show slightly more complex results in the comparison of instruments, but the entitled permit market would still be the lowest cost option.

Distributive impacts, competition and uncertainties

These analyses of the cost consequences for industry, remind us that the "equal MAC national entitlement" hypothesis used in Section 2. is only but one of the possible cases. As illustrated above an auctioned permit system would of course introduce strong dis-

tributive consequences, but it would also raise several difficult questions such as:

- What institution would receive the probably large funds resulting from the auction and for what uses?
- What should be the total amount of permits auctioned at EU level for the subset of energy intensive industries and power producers?
- How would the emission profile of each sector participating in the auction permits, be made compatible with the sectoral targets of national policies?

Comparatively, the entitled permit system seems to present in its definition and implementation less uncertainties and consistency problems. Besides the fact that it would probably be preferred by industrialists (as involving less transfers from their part) it would also respect the consistency of national abatement policies.

One key remaining issue is however that it may raise problems of competition between similar industries in the EU. Indeed while every participant would gain from trade, some of them may gain much more than others, as illustrated in Table 2. These may probably claim that the situation results in an unfair competition inside the EU. More important than the particular results obtained in this preliminary simulation is the fact that this type of situation may exist, depending on the national targets, structural conditions and sectoral entitlement policies. This latter issue is probably the one that should deserve the more attention in the process of launching a European permit trading scheme.

Conclusion

This exploratory study aimed at identifying some key issues related to the implementation of a European CO_2 emission permit trading system for energy intensive industries and power generators. The quantitative results of the simulation – performed for entitlements with equal sectoral marginal costs at the national level – show that the gains to be expected from this type of system are large. It may indeed capture half of the total gain of a hypothetical full-EU trading system, relatively to a no-trade situation. As it was to be expected, all sectors participating in this market may gain from trade, but the simulation also shows that some sectors in some countries gain much more than others.

The study thus indicates that several key issues should deserve, in the process of designing the EU tradable emission permit system, more in-depth analyses. In the case of an auctioned permit system the key issues relate to the status of the authority in charge of emitting the permits and receiving the corresponding funds, as well as to the necessary consistency between the EU market and the national policies. In the case of national sectoral entitlements, it remains to be studied how entitlement schemes different from the one considered in the study would allow to combine economic effectiveness in the implementation of national emission reduction policies and fair competition conditions among the different European industrial sectors.

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Session 3: Perspective for EU enlargement

Rapporteur's Summary *by Peter Helby, Lund University, Environmental and Energy Systems Studies, Sweden.*

Introduction

The presentations of session 3 were too divergent in content to give any holistic picture of the relations between Kyoto mechanisms and enlargement of the European Union. However, taking into account statements also from the previous sessions, a few positive observations are possible, and several open questions and potential problems can be brought to the attention of the audience before departure from the forum.

Positive observations

- Enlargement will bring into the Union a significant amount of un-used emissions rights, i.e. a contribution more likely to be welcomed by the present member states than the agricultural surpluses and extra labour resources that enlargement will also bring into the Union. Possibly, the emission rights can even have a certain value for the accession countries as bargaining chips.
- Some accession countries are doing a serious and probably successful job of preparing the institutional framework for sharing emission rights with other member states under either fast track joint implementation or emission trading rules.

Open questions

- Are the positive observations above valid for other countries than Poland and the Czech Republic?
- Will the accession countries become part of the EU bubble and will they be integrated in a specific EU regime, that goes beyond the general Kyoto regime?
- Does the foreseen abundance of emission rights constitute only a short-term phenomenon, likely to be a source of turbulence in the enlarged Union? Or are accession countries already going through the process of decoupling of CO_2-emissions from economic growth, so that they may become a long-term source of emission rights, permanently influencing the dynamics of CO_2-reduction in the Union.

Potential problems

- Accession countries seem often to be waiting for initiatives from Brussels, rather than going forward with institution building based on their own judgement. Unlike so many other areas, where accession countries are required to implement l'acquis communautaire created by others, the area discussed at this conference is one, where l'acquis does not yet exist, but is in the process of creation. In such cases, initiative and experimentation by member states is usually an important part of the policy process in the Union. As the accession countries have much greater scope than present member states for being host to joint implementation projects or exporter of emission rights, they here have a chance to take the initiative, to be prime movers, rather than simply reacting to initiatives from Brussels. This would be to their own advantage, but is also important for the Union, which only works well when member states join the policy process in an active way and with a sense of responsibility.
- The presentations and discussions relating to EU enlargement tended to be more about distributional consequences of different modes of implementing the Kyoto mechanisms, than about maximising their effectiveness as tools for sustainable development. As the purpose of the cash-flows being created by the protocol is to serve as incentives for sustainable development, rather than as a source of redistribution or enrichment, it is somewhat worrying that distributional aspects get so much attention compared to the more relevant subject of incentive effectiveness. Potentially, such tendencies could cast doubt on the legitimacy of the cash-flows.
- A certain conflict was evident between market based and state monopoly approaches to joint implementation and emission trading. While a strong regulatory role of the state is certainly needed in this area, it is less clear why state organisations should monopolise the trade in emission rights or joint implementation credits, as suggested by some participants. State monopoly could easily create a conflict between the institutionalisation of Kyoto mechanisms and the goals of the enlargement process, unless clear and strong environmental arguments are put forward in favour of state monopoly. But the arguments heard in the discussions seemed to be more about national interests, the entrenchment of which is neither the purpose of the enlargement process nor of the Kyoto Protocol.

Status of the implementation of the "Acquis Communautaires" [30]

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Keywords. Acquis Communautaires, candidate countries, Poland, emission trading, flexibility instruments, Kyoto Protocol, climate change

Abstract. This paper presents the state of the Acquis Communautaires in Poland, i.e. the degree to which EU law has been implemented in Poland in view of its accession to EU membership. After a general view on all chapters of the implementation process, the paper focuses in particular on the Environment Chapter and the Energy Chapter. Poland, in the past years has carried out considerable efforts, and has invested substantial financial means (both from the state and the private sector) in order to comply with European Union law on the environment, although this chapter is not yet fully closed, and transitional arrangements have been requested by Poland in several fields. With respect to the flexibility instruments, in particular international emissions trading, it would accelerate the national implementation process, which has already started in some respects, if these instruments would become part of the EU Acquis Communautaires given the current strong focus of policy makers on the integration process with the EU.

Introduction

The government of Poland has adopted December 31, 2002 as the date on which Poland will have finished the process of harmonisation of its laws with Community Laws and will be prepared for accession to the European Union. In the first stage, Acquis Communautaires is being transposed to the Polish law and the next stage covers implementation. Acquis Communautaires was divided into 29 areas, in which Poland presented its position and in which negotiations are going on. Poland has already closed negotiations in 13 areas. These areas are Science & Research (Chapter 17), Telecommunication and Information Technologies (Chapter 19), Education, Training and Youth (Chapter 18), Culture and Audiovisual Policy (Chapter 20), Industrial Policy (Chapter 15), Small and Medium Sized Enterprises (Chapter 16), Common Foreign and Security Policy (Chapter 27), Consumers and Health Protection (Chapter 23), Statistics (Chapter 12), External Relations (Chapter 26), Economic and Monetary Union (Chapter 11), Freedom to Provide Services (Chapter 3), and Financial Control (Chapter 28).

Environment Chapter

Environment is one of the most difficult subjects from the remaining areas (the second is Agriculture). Under three programmes (PHARE, ISPA and SAPARD), the European Union provides assistance for investments and institution building necessary for integration. Very often, assistance in institutional strengthening takes the form of twinning arrangements where officials or experts from member countries are seconded to work with the Polish counterparts on the implementation of Acquis Communautaires in a given area.

In 2000 three such projects were implemented in the area of Environment. They concerned strengthening of environmental impact assessment, air quality assessment systems and pollution prevention, and control at internal level. Also in 2000 eight projects were approved under ISPRA: five concerned water and waste water management, three were related to waste.

Poland fully endorses the objectives of the European Union Policy with regard to Environmental Protection and shall seek to implement the Union standards in force. Since 1991 we have consistently implemented a state environment policy, which is based on principles of sustainable development. We have managed to achieve considerable improvement of the state of environment and increased public awareness on the subject. Poland already adopted a part of the EU legislation in the environment field and is preparing for the implementation of the other parts.

However, the cost of implementation would largely exceed the possibilities of the state budget and of Polish enterprises. It will therefore be necessary to work in some areas on transitional arrangements. Over the ten last years, Poland implemented a large number of projects which brought substantial improvement in the state of environment. Emissions to air and water were reduced, legally protected areas were expanded and Poland ratified a number of international conventions on the environment. The improvement in the state of the environment was possible due to an effective system for financing of environmental protection. The basic sources of financing environmental investments are environmental funds and investors' own funds. Environmental funds manage financial means related to the economic use of the environment and penalties for the violation of pollution emission limits. In Poland, there are also fees for the emission of carbon dioxide, although they are not very high. Over the past years about 2 billion Euros were spent every year on environmental protection in Poland. In 1997 it was 8.1% of the value of all investment expenditures. Despite this large effort there is still a certain gap between the present state of environment in Poland and the state that would be in compliance with the legal acts on environment in the European Union. The costs estimated to be fully in compliance is estimated at 30 billion Euros. For this reason, Poland has asked for transitional arrangements in the implementation of 13 directives in the field of environmental protection. At present there are some new acts in the legislative process that will transpose most of the EU directives. These acts are: act of environmental protection, water law, act on waste, act on packaging and packaging waste, act on toxic and polluting substances.

Concerning the transitional arrangements for 13 directives, five concern waste, four water, one volatile organic compounds, one ozone depleting substances, IPPC and radiation protection.

[30] Transcription of the oral presentation by E. Anzorge.

Implementation of the Climate Convention

There is one directive which concerns directly the implementation of the Climate Convention (Council Decision of 21 June 1993 for a Monitoring Mechanism for CO_2 and other greenhouse gas emissions (GHG). Poland is a party to the Convention since 1994 and as a party is fulfilling its obligations under the Convention. The obligation to stabilise GHG emissions by the year 2000 was fulfilled and, in fact, Polish emissions are far below this level in the year 2000 (though official data are not yet available) but in 1998 the emissions of GHGs amounted to 72% of the base year (1988) emissions.

Poland fulfils also obligations concerning reporting. Some inventories were submitted with delay but we asked for some flexibility for countries in transition. First, we submitted inventories every two years, but now, the lacking inventories are also prepared. The ministry of environment established in 2000 the national centre for emission inventories. The centre will prepare emission inventories for various conventions, e.g. for the Geneva Convention, for European Union Environmental Agency and also for the Climate Convention and the Kyoto Protocol. This centre will maintain national registries of Assigned Amounts for the purpose of international emission trading or transfers under Joint Implementation. In this way, Poland is able to fulfil eligibility criteria for the participation in Kyoto Mechanisms, as the ones currently under discussion.

Also, the ministry of environment is preparing a strategy of climate protection and is investigating what should be prepared in our laws to allow for emission trading, because at present Polish law does not cover trading of emissions. Poland is waiting for concrete COP decisions, precising terms and conditions of trading and transfers under Joint Implementation, but any step from the European Union would be helpful for Poland. For our decision makers the priority currently is for the integration into the European Union, they mainly work on this area and the laws that are in relationship with the European Union. Therefore, if there are provisions for emission trading in the Acquis Communautaires, they will be transferred to national laws. Even the new act on environmental protection that is currently in parliament does not create the conditions for the transfer of emission units. This act is transposing the IPPC directive and is linking permits for emissions to a complete installation. It seems therefore difficult to transfer permits that are constructed in such a way. Introduction of emission trading will require changes in this new act.

The Energy Chapter

Let me say also some words about energy. In this area our energy law and the geological and the mining law are consistent with the Acquis Communautaires. Poland will, of course, implement all Acquis Communautaires in this field by 2002 with the exception of two points:

Directive 98/30 relating to common rules for the Internal Market for natural gas and of Directive 68/414 relating to obligations of member states to maintain minimum stocks of crude oil and petroleum products. In relation to this last obligation Poland asked for a transitional period for eight years until the end of December 2010. We asked for a limitation of the range of stocks by excluding fuel oil from the mandatory stocks and by increasing the share of crude oil in the mandatory stocks up to 80%.

In relation to the gas directive Poland requested a three years transition period until the end of 2005. This is because the Polish gas market currently is not prepared for competition on the liberalised EU gas market and during the transitional period we will carry out restructuring and privatisation of the gas industry. New entities working in the field of exploration, transport, storage, distribution and sales of gas should be established. This period will also enable the entities to operate at least one year on domestic competitive markets with free prices before the implementation of the EU directive. Further, the implementation of the directive requires additional expenses of the order of 200 million Zloties for the connection to the EU transmission grid and another 200 million Zloties for upgrading measurement systems in pressure reduction stations.

Outlook

The implementation of the Acquis Communautaires requires great efforts from the administration and also a lot of expenditure for the necessary investments from the state budget and the private sector. Poland has undertaken these tasks on a voluntary basis in order to become a member of the European Union and strives to finish all chapters before the deadline at the end of 2002. With regards the Convention and the Kyoto Protocol it would be very useful for Poland to participate in the preparation of the European Union legislation. Poland would then be able to prepare its own legislation in this field because international trading of emissions should have the same rules so that all countries would trade the same permits on an equal basis.

Emissions Trading in Poland.

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Keywords. Emissions trading, climate change, Poland, energy sector.

Abstract. This paper discusses where and whether a domestic greenhouse gas trading system in Poland could be implemented. It argues that emission trends suggest that a domestic trading regime would be not necessary to meet the Polish Kyoto target. However, if Poland wants to participate in an emerging trading system in Europe or if it wants to become a major seller of emissions permits in an international permit trading market, it would be useful for Poland to introduce a domestic trading regime.

Introduction

Poland was one of the first countries in Europe that has considered the introduction of emissions trading as a policy instrument. But following initial enthusiasm regarding this new policy instrument in the early nineties, it has yet to be implemented. Under the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) of 1997, Poland has now the possibility to participate in international greenhouse gas trading. So the question arises whether and how Poland should implement domestic greenhouse gas trading in order to facilitate its participation in international trading.

After discussing Polish energy and emission trends, the status of Polish climate policy is considered. Following this, the issue of where a domestic trading regime could be implemented is analysed. Conclusions are finally drawn against a background of domestic, regional and international politics. This paper draws heavily on Hauff (2000) and Hauff and Missfeldt (2001).

Trends of Energy Use and Emissions in Poland

Like in other Economies in Transition, Poland's economic growth plummeted along with the transition to a market economy in the early nineties.

The current greenhouse gas emissions are still dominated by emissions from the energy sector. The shares of total CO_2 emissions in 1997 in various sectors were as follows:

- Energy and transformation industries 53%
- Industry and construction 19%
- Transport 7%
- Other sectors 17%

The reason for the high share of emissions from the energy sector is the continuously high share of the use of coal in the energy supply mix, as data from 1997 reveals:

- Steam, Coking and brown coal 70%
- Natural gas 9%
- Crude oil 15%
- Hydro, wind, biomass 5%.

But the coal sector reform, which was brought on its way with the help of the World Bank in 1998 will contribute to reducing emissions from this sector among others through the closure of unprofitable mines.

Poland and Climate Change

Poland ratified the Convention on Climate Change in 1994, and signed the Kyoto Protocol as early as 1998. Under the Protocol, Poland is committed to 6% reduction of the main six greenhouse gases compared with 1988 (KP, 1997). Polish base year emissions, excluding emissions uptake from the land-use, land-use change and forestry sector, were 561,021Gg, with 476,625Gg from CO_2 alone. This makes Poland the third largest emitter in the region following Ukraine and Russia.

As a result of the shift in economic regime, future trends in emissions are similar to other economies in transition subject to high uncertainties. Reflecting the large uncertainties of emissions, projections for 2010 range from +23 to -11% compared to 1988 (National Communication 1, National Communication 2). Recent projections, however, confirm a steep downwards trend for 2010 with around -15% below 1988 emissions (FEWE, 1999).

This projection points to a large potential of Polish emission sales in an international greenhouse gas market. In addition, further 20% reductions can be reached at a cost of less than 20 USD, as a 'with measures' scenario shows (FEWE, 1999).

Polish environmental law is based on its Water Law from 1974, which was complemented by the Environmental Protection Act of 1980. Since 1994, Poland has an office for Joint Implementation, and in 1999 an office for the implementation of the UNFCCC (1999) was added.

Polish environmental expenditure at 1.1% of GDP is well within the range of other OECD countries, and well above that of Germany with 0.5% of GDP. Poland levies emission fees and standards. For example a nominal CO_2 and CH_4 fee exists at 82.7 USD/ton, and a much higher SO_2 fee is levied at 82.7 USD/ton. While before transition enforcing such levies was difficult, and to some extent meaningless (soft budget constraint), following transition enforcement has improved.

Since passing the Decree of the Council of Minister from August 5, 1998, reporting on emissions by industry, including from greenhouse gases is a strict requirement (Hauff, 2000, p.19). The software most commonly used for such reporting is called 'SOZAT'. Although there is no requirement to use this software,

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it is most widely spread, and facilitates raising standardised data.

Poland is one of the few countries in Europe with existing experiences in emissions trading. Two trials for emissions trading have been conducted, one in Chorzów in 1991, and a computer simulation in Opole in 1994. The example in Chorzów with one representative trade illustrates well the type of cost savings and emissions reductions that may be generated through emissions trading. In Chorzów there is a steel mill which exhibits comparatively low abatement costs, while a neighbouring power plant has higher costs. The 'deal' of Chorzów meant that the steel plant with lower costs would adopt a stricter emissions reductions target for which it would be subsidised. The power plant in turn would reduce less, but pay a higher fee. While this arrangement was cheaper for both plants, in the period from 1991-92 joint reductions of 51% of particulate emissions, 93% of CO and 31% of SO_2 were realised. However, the experiment has not been repeated, because there is no legislation in Poland, which would allow for such transfers among plants.

Possible domestic trading systems in Poland

Using an upstream-downstream analysis, Hauff (2000) identifies where a trading regime could be located in the Polish economy. Hauff's analysis is limited to CO_2 emissions from energy and industry. An upstream-downstream analysis aims at finding the ideal point of incidence for emissions trading in the energy system. Downstream is thereby the location of where energy is converted into CO_2 emissions. Hauff examines a 'core' downstream system as suggested by Festa (1998). Such a system suggests that trading is implemented in the heat and power sector as well as for energy intensive industry. An upstream system focuses on the location of where energy sources enter the Polish market. Commonly it is assumed that the flexibility to react to a downstream system is greater, because real options for switching to alternative energy sources and technology options exist. An upstream system, while achieving a better coverage of emissions at commonly lower transaction costs, leaves little options to industry except for reducing production and/or import of energy sources.

Table 1: Survey Statistics

Sector	**Questionnaires**		
	Sent	Returned	Percentage returned
Power, CHP[32]	80	40	50
Industry	150	33	22
Coal mines	46	1	2
Total	**276**	**75**	**27**

Hauff's (2000) analysis was based on a sector analysis, which was supported with a survey among industry. Table 1 summarises the return rate of the survey. 276 questionnaires were sent in total with a return rate of 27%.

A downstream system in the power and heat sector in Poland could comprise few large entities that would ensure good trading coverage in the power sector. This would include:

- the 20 biggest professional plants, which would cover 91% from professional power, i.e. those bigger than 300 MW(e);
- the 46 plant (>50MW), which cover 100% of professional power;
- the 110 industrial power plant and CHP > 5MW(e), at 93% of such CO_2 emissions.

The survey results indicated that the power industry shows high levels of awareness on emissions trading, probably as a result of a discussion in the early nineties to introduce SO_2 trading in the sector. They also appear to share a generally positive attitude with respect to introducing emissions trading. The inclusion of the heat sector, however, is more difficult.

When considering the inclusion of energy intensive industries in a downstream system the problem of lack of data availability in the sector is apparent. Hauff (2000) uses an indirect method to deduce the importance of industry contributions to greenhouse gas emissions in this sector.

Hauff (2000) suggests that the five largest industries could be included in a trading regime: coke and refining, chemical, metallurgical, mineral and food and beverages industries could be included. This would amount to coverage of about 1,400 enterprises. Table 2 summarises the elements of a downstream system.

Table 2: A downstream system

Sector	**Participants**	**Entities with monitoring requirements**
Power and heat generation	46 professional power and CHP companies plus 160-180 industrial CHP producers.	120 professional power and CHP plants. All 160-180 industrial CHP plants.
Energy intensive industries	1,400 large enterprises in five energy intensive sectors	Minimum of 1,400
Total	**About 1620 entities**	**1,700 or more**

An upstream system could comprise the coal, the gas and the oil sector. To be comprehensive, it should also cover net exports of electricity. In the coal sector the 9 domestic coal companies, which run 64 coal preparation plants, could be potential partners. Also an unspecified number of coal importers should be included. A serious problem with targeting the coal sector is that hefty resistance may be expected from the coal lobby, as the sector is subject to severe restructuring. What is more, the restructuring activities will lead to decreasing output levels, which could question the need for explicit reduction targets from this sector.

[32] Combined Heat and Power

For the gas sector a suitable point of incidence could be a combination of permits for the net imports with domestically produced gas at the point where the gas is introduced in the distribution system. An exemption for non-energy users is required. A complication arises in the context of methane emissions from coal-beds and landfill sites, where currently fees are required. If those fees remained low, then under a pure CO_2 trading regime there could be an incentive to continue ventilating methane.

Table 3: An upstream system

Sector	**Participants**	**Where carbon would be monitored**
Coal	9 producers; uncertain number of (small) importers	64 coal preparation plants and/or 54 coal mines, all importers
Gas	One producer and importer	About 60 gas fields, some direct deliveries from well, one importer
Oil	Four independent refineries, 160 importers	Seven refineries, 160 licensed importers
Electricity import	Approximately 200 entities of which 20-25 major companies	One importer
Total	**Approximately 200 entities of which 20-25 major companies**	**Approximately 270-350, of which around 185 major installations.**

In the oil sector the regulation at the exit of refinery could be most feasible, as less than 200 entities would be required to report data. The oil sector is the least complicated sector to include in an upstream system, as it is the sector with most internal competition. But the number of mitigation options is limited at the refinery level. Table 3 gives an overview of a possible upstream system.

What trading system is feasible?

The scenarios in Hauff (2000) are not easily translated in the share of total greenhouse gas emissions that the suggested upstream or downstream systems would cover. However, the share of CO_2 emissions from energy industries can be used as a proxy for an upstream system, while the CO_2 emissions from fuel combustion could be used as a proxy for a downstream system. At 236,582 Gg of CO_2 from energy industries in 1990, an upstream system would cover around 62% of the Polish CO_2, and 42% of the total Polish greenhouse gas emissions.[33] At 371,433 Gg of CO_2 from fuel combustion in 1990, a downstream system would cover 98% of CO_2, and 66% of total greenhouse gas emissions. Coverage is thus better under a downstream regime. Greater coverage of gases implicitly warrants a greater environmental integrity of the system.

But transactions costs are likely to be higher under a downstream regime as the upstream regime would require regulation of only 12% of the number of entities that require regulation under the suggested downstream regime. In addition, the data availability among energy intensive industry is very low.

Oligopolistic market power would be a higher threat under an upstream regime, where trading is likely to be dominated by the 20-25 bigger plants. Such market power is also important before a trading system starts up, as plants could more readily bargain for more lenient targets.

While the upstream system would be politically feasible both in the gas and the oil sector, it seems politically infeasible in the coal sector as a result of the restructuring of this sector. As the coal sector generates 70% of CO_2 emissions, this almost excludes an upstream system in Poland.

When considering the compatibility of a domestic regime both at the regional and the international level, the European Commission's draft directive on emissions trading (EC, 2001) has to be taken into account. The Directive envisages a downstream system to be implemented in the EU.

From a technical point of view Poland does not need a domestic emissions trading regime in order to participate in international greenhouse gas trading. The Joint Implementation (JI) Office in Warsaw, for example, envisages a credit-trading regime. The JI office would thereby act as an intermediate broker, which sells emission reductions permits on the basis of a set of projects conducted in Poland. It would thereby act in a comparable way as the World Bank's Prototype Carbon Fund.

Poland as Accession Country: Conclusions

From a domestic viewpoint there is no urgent case for CO_2 trading in Poland in early 2001. Arguments in favour come through the possibility to more effectively participate in an international regime, where a domestic regime could enable the gaining of experience. The sector where domestic emissions trading appears to be more feasible is the power and heat sector as part of a downstream trading regime.

Poland along with other accession countries should be taken on board early, before an EU trading scheme is designed.

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[33] The uptake of emissions though sinks is hereby not accounted for.

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Poland's participation in the implementation of flexible mechanisms (emissions trading and Joint Implementation) in the context of its integration with the European Union.

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Keywords. Emission trading, Joint Implementation, flexibility instruments, Kyoto Protocol, climate change, Poland

Abstract. Poland, which aspires to join the countries that are members of the European Union faces the challenge of having to answer the question: if, when and under what conditions it should take part in the implementation of flexible mechanisms. At present, Poland participates in the AIJ pilot phase as the host country. In general, Poland is interested in the implementation of a specific number of JI projects in Poland, approving the transfer of agreed carbon credits generated by the implementation of a given project to the investor in 2008-2012. now and in the first commitment period under the Kyoto Protocol (2008-2012). Poland – like other countries in Central and Eastern Europe – emits less greenhouse gas emissions compared with the requirement to reduce its emissions by 6% with respect to the base year as adopted for Poland. Poland is therefore interested in taking part in international emission reduction trading as soon as possible. Poland is preparing to implement its emission reduction trading system in two stages, primarily for carbon dioxide, by working on the adjustment of the Polish law to such trading and on the system for dividing emission caps between sectors and companies. Under Article 4.4 of the Kyoto Protocol, in the first commitment period, the Member States of the European Union must meet their commitments on their own within the "bubble" scheme and an alteration in the composition of the Union cannot affect these commitments. This means that in this period the Candidate Countries can meet their commitments outside of the "bubble", i.e. their emission reduction trading cannot be limited to the Member States only, but can also be conducted with all the Annex-I countries. Poland intends to trade primarily with the Member States of the European Union, but its choice of partners will depend on the market rules. In the second commitment period Poland is likely to join the "bubble" of the European Union. Permanent working contacts between the Candidate Countries and the European Union are therefore necessary in order to develop a joint basis for trading in practice. This will facilitate efficient and smooth integration of national systems with that of the European Union.

Introduction

Articles 6 and 17 of the Kyoto Protocol allow the Parties to fulfil their greenhouse gas emission reduction commitments outside of their territories, by, among other things, using the economic mechanisms called emissions trading and Joint Implementation.

Despite the fact the Kyoto Protocol has not been ratified to date by any European country, even now there is a large interest in international pilot transac-

tions and some European countries have advanced very much their work on the implementation of their national emission reduction trading systems. In the world, several hundred Joint Implementation pilot projects have been implemented or are in the course of implementation.

Poland, which aspires to join the countries that are members of the European Union, has also faced the challenge of having to answer the question: if, when and under what conditions it should take part in emission reduction trading.

How can Joint Implementation Projects be implemented now, when foreign investors are interested only in such projects where credit sharing is provided for and when the pilot phase of this mechanism, which does not provide for such sharing, is still carried out.

Flexibility instruments in Poland

At present, Poland participates in the AIJ pilot phase as the host country. Polish-Norwegian and Polish-Dutch projects are under way. In the framework of the Norwegian project, coal to gas conversion is implemented in about 30 local boiler-houses and energy efficiency is improved in housing (heat insulation and energy saving equipment). In the framework of the co-operation with the Netherlands, projects are carried out to reduce air pollution by modernising the heating system and to supply heat and electricity as a result of coal to gas conversion. These projects include no provisions on the proposed carbon credit sharing.

The first JI project (providing for carbon credit sharing) was implemented in Jelenia Góra by the installation of a Dutch bio-mass fired boiler (firing wood chips) for the municipal greenery unit.

The Polish-Canadian JI project is under way to build a hydropower plant with the power of 900 kW on the Bóbr River, at Leszno Górne in Lubuskie Voivodship.

Work is very advanced on the launching of the implementation of a large project to build a wind farm (60 MW) on the Polish coast, mainly financed by a Dutch investor, which is very likely to be co-financed by the Dutch Government, in the framework of the ERU-PT Programme. The implementation of this project is very important for Poland in the light of the strategy for increasing the share of renewable energy sources in Poland (by 7.5% until 2010), which the Polish Government adopted a few months ago.

In the framework of international co-operation, in the JOINT project established by the European Commission, we are trying to create conditions for the implementation of the Finnish-Polish project to modernise the heating company PEC Elbląg to allow its combined heat and electricity production.

Certain logistic problems hampering the implementation of JI investment projects should be stressed. The European countries which express their interest in co-operation in the JI area do not want to take part in AIJ projects. The condition for the co-operation is to include provisions for sharing of carbon credits generated by the project generated by the project implementation. It is often requested that the foreign investor should acquire carbon credits for a period longer than 2008-2012, i.e., the first commitment period. In accordance with the provisions of the Kyoto Protocol, Poland does not prefer such solutions, although they are quite small in the pilot implementations in Poland.

In general, Poland is interested in the implementation of a specific number of JI projects in Poland, approving the transfer of agreed carbon credits generated by the implementation of a given project to the investor in 2008-2012.

Types of emissions trading

Emission reduction trading requires the definition of the object of trading between the parties. In this case, the object will be emission reduction units, which will be equivalent by weight to the reduced quantity of greenhouse gas emissions.

Under such a definition, emission reduction trading cannot be recognised as typical trading, subject to taxes and custom duties. The product traded does not move from its place, therefore, it is not subject to custom duties in effect for the import of goods.

In general, today one can speak of several types of possible trading:

- International emission reduction trading at the governmental level or conducted between the government and a company.
  An intergovernmental agreement regulates a trade transaction between two countries (or between a country and a company), setting out the number of emission reduction units which one country sells to another at a contractual price. In the case of an intergovernmental agreement, by taking the responsibility for meeting the national commitment under the Kyoto Protocol, the selling government gives essential credibility to this transaction.
- International emission reduction trading between companies
  A commercial contract between two companies sets out the conditions under which a specific number of emission reduction units is sold. The selling company should obtain approval of this transaction by the government of its country, as the government is responsible for meeting the national commitments in this area (just as in the case of Joint Implementation projects).
- National emission reduction trading
  A national emission reduction trading system is introduced in the territory of a given country. By an administrative procedure, in the economic sectors where such a system is to operate, emission caps are established for individual companies which can trade in emission reduction units, in the case of sales, when as a result of their actions to reduce their emission levels they have surpluses, i.e. they emit less than allowed under the caps.

Poland's economic and political position on the ratification of the Kyoto Protocol

In my opinion, Poland should be viably interested in taking part in international emission reduction trading as soon as possible and this type of emission reduction trading is our country's priority.

This opinion is supported by the fact that now and in the first commitment period under the Kyoto Protocol (2008-2012) Poland has a surplus of reduced greenhouse gas emissions compared with the requirement to reduce its emissions by 6% with respect to the base year as adopted for Poland.

The situation of the other countries in Central and Eastern Europe is just as good, as they also have surpluses of emission reductions with regard to their commitments.

Table 1: Potential GHG emission surpluses in the EIT (Economies in Transition) Parties during the first commitment period

GHG emissions by EIT [in Gg]						
	Base year	1997	BaU2010	Abs diff.	KP com at	Surpluses
Bulgaria	**132060**	82750	**107170**	-24890	121495,2	**14325**
Czech Republic	**171680**	145240	**165770**	-5910	157945,6	*-7824*
Estonia	**36000**	21030	**31010**	-4990	33120	**2110**
Hungary	**106370**	79200	**94740**	-11630	99987,8	**5248**
Latvia	**32870**	11820	**20710**	-12160	30240,4	**9530**
Lithuania	**45170**	24750	**41620**	-3550	41556,4	*-64*
Poland	**550420**	425680	**497440**	-52980	517394,8	**19955**
Romania	**273010**	153140	**223860**	-49150	251169,2	**27309**
Russian Federation	**3035460**	1981320	**2763460**	-272000	3035460	**272000**
Slovakia	**70400**	50640	**64090**	-6310	64768	**678**
Slovenia	**18650**	*20140*	**22770**	4120	17158	*-5612*
Ukraine	**907440**	534970	**825780**	-81660	907440	**81660**
EU	**4332950**	**4236850**	**4456210**	**123260**	**3986314**	***-469896***

according to R.A Reinstain 1999

The clear support voiced here for Poland's participation in international emission reduction trading is based on economic argument. We have a documented surplus of emission reductions in respect to our commitments and we can sell it without any greater risk.

From the political point of view, the issue of Poland's participation in emission reduction trading under the Kyoto Protocol is an open one. It was with misgiving that Poland took the position of the European Union as presented by France at the Conference of the Parties in The Hague expressing its approval of an additional tax burden on such trading in favour of the developing countries. This is in contradiction with the provisions of the Protocol and against the position of the Candidate Countries, indicating that the Union is ready to meet the demands of the developing countries at the expense of the Candidate Countries. Following the adoption of such additional burdens on the Candidate Countries, the possibility of Poland's participation in international emission reduction trading becomes uncertain – and it will certainly diminish the interest of potential participants in emissions trading. A similar situation can be seen in the case of Joint Implementation projects on which the European Union also wants to impose taxes.

Two stages of Poland's participation in emissions trading

Nevertheless, irrespective of the final political solutions, Poland is preparing to implement its emission reduction trading system, primarily for carbon dioxide, by working on the adjustment of the Polish law to such trading and on the system for dividing emission caps between sectors and companies. At the same time, we take part in simulations of such trading carried out by IEA, UNIPEDE and other international institutions.

The concept of participation in such trading envisages that it would be divided into two stages:

1. Participation in international emission reduction trading at the governmental level (or conducted between the government and a company). In such a case the trading would be conducted by an institution authorised by the government. Every year, the institution would receive a limit of emission reduction units to sell, established on the basis of an inventory for the previous year (the real emission reductions generated by specific investment projects). The revenues would be allocated to investments aimed at further reductions, with preference given to those sectors and companies that have made the greatest contribution to such reductions or where such reductions can be achieved most effectively. It is a system which is relatively cheap and makes it possible to begin trading soon.
2. Authorisation for international and national emission reduction trading granted to companies which have emission caps and can demonstrate real and sustainable reductions. This means that the right to participate in trading would be given primarily to large companies from selected sectors (e.g. power generation, metallurgy, refineries, chemical and mineral industries). At a later date, companies would be authorised to participate in international trading. Control of such trading would be exercised by an institution or institutions designated by the government. The institution or institutions would be empowered to impose caps and monitor and certify reductions. The trading itself would take the form of purchases of shares allowed for trading on the international market. However, for the purposes of this stage, it would be necessary to develop an operational system for granting caps, monitoring and certification, which will take more time.

In both cases, it will be necessary to launch a pilot phase in order to gain experience in actual emissions trading.

Poland and the European "bubble"

By a decision of the Minister of the Environment taken in 2000, the National Fund for Environmental Protection and Water Management was designated as the institution to conduct work to develop the basis for greenhouse gas emission reduction trading. In

carrying out studies on this problem, we certainly draw on experiences of other countries, including the "Green Paper". However, from our point of view, the practical experiences are most interesting, but in this scope we can follow mainly the Danish and American experiences. For this reason we have entered into contacts with the relevant institutions in both of the aforementioned countries in order to use their experiences in the field in question. We also draw on the experiences of Slovakia with regard to the legislative aspects of such trading.

Under Article 4.4 of the Kyoto Protocol, in the first commitment period, the Member States of the European Union must meet their commitments on their own within the "bubble" scheme and an alteration in the composition of the Union cannot affect these commitments.

This means that in this period the Candidate Countries can meet their commitments outside of the "bubble", i.e. their emission reduction trading cannot be limited to the Member States only, but can also be conducted with all the Annex-I countries. Certainly, Poland intends to trade primarily with the Member States of the European Union, but its choice of partners will depend on the market rules.

Envisaging that in the perspective of the second commitment period Poland is likely to join the "bubble" of the European Union, we believe that it would be useful even now to establish permanent working contacts between the Candidate Countries and the European Union in order to develop a joint basis for trading in practice. This will facilitate efficient and smooth integration of national systems with that of the European Union. As a first task, we believe that is necessary to develop another version of the "Green Paper" taking into account the specificity of the Candidate Countries and concerned to a greater extent with the practical aspects (legislation, organisation, institutions, trading rules).

Conclusion

In conclusion, Poland is viably interested in the quick implementation of the Kyoto Protocol mechanisms, particularly in the Joint Implementation area (projects in the range of alternative energy sources and energy saving) and in setting in operation international emissions trading, as a result of which we would be able to sell part of our surplus of reduced emissions.

Experiences with the National Strategy Study for the Czech Republic.

Miroslav Malý, SRC International CS[34] *and Lubomir Nondek, DHV CR*[35]

Keywords. Greenhouse gas (GHG) emissions, emission scenarios, marginal abatement costs (MACs), Joint implementation, emission trading, Czech Republic

Abstract. The paper presents a brief review of the outputs of the study "Estimate of the Economic Costs for Reduction of Greenhouse Gas Emissions". The study deals mainly with the following tasks:

1. Development of GHG emission scenarios for the Czech Republic till 2012;
2. Estimation of marginal abatement costs (MACs) in selected sectors and on the national level; and
3. Estimate of the reduction potential of AIJ/JI and international/domestic emission trading.

Introduction

The Czech Republic (CR) signed the Kyoto Protocol in November 1998 and therefore committed itself to achieve 8% reduction of its aggregated GHG emissions during the first commitment period (2008-2012) of the Kyoto Protocol as compared to 1990 emission level. At present, the country's emissions are about 25% below 1990 level. However, the various emission projections elaborated previously indicate emission growth after 2000. A set of policies and measures to prevent a next growth of GHG emissions and resulting non-commitment with country's Kyoto emission ceiling has been presented by the Czech Government as "Strategy to Mitigate Climate Change in the Czech Republic" – Resolution of the Czech Government No. 480/1999 Coll. (thereinafter also *Strategy*).

In 1997 just before COP-3, "National Strategy for JI in the Czech Republic" (thereinafter also *NSS*) has been prepared by an international team co-ordinated by the World Bank experts and financed by the Swiss Government[36]. In the *NSS*, the emission projections, scenarios and abatement costs were calculated for the Czech Republic for the first time using the MARKAL model.

In 2000 a follow up study of the *NSS* was carried out within a PHARE Project No. CZ9705-05-01-02 "Estimate of the Economic Costs for Reduction of Greenhouse Gas Emissions" (thereinafter also the *Phare study*)). The *Phare study* was carried out by Carl Bro International a/s (Contractor) and DHV CR,

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[36] *National Strategy for Joint Implementation in the Czech Republic*, MoE, World Bank, Swiss Office for AIJ, Prague, 1997.

Ltd. and SRC International CS, Ltd. (Sub-Contractors). The Project has been launched in January 2000 and its duration was 6 months. The major beneficiaries of the study are the Ministry of the Environment of the Czech Republic and Inter-ministerial Committee on Climate Change.

The study deals mainly with the following tasks:

1. Development of GHG emission scenarios;
2. Estimation of marginal abatement costs (MACs); and
3. Estimate of the reduction potential of AIJ/JI and international/domestic emission trading.

The paper gives a brief review of the study outputs.

Development of GHG emission scenarios

National GHG emissions

The annual national inventory of GHGs carried out since 1990 shows that CO_2 presents about 85% of the total GHG emissions. The major part of CO_2 is emitted by combustion processes (approx. 97% of all CO_2 emissions in the Czech Republic). The Project has been therefore focused on projections of CO_2 emissions. Another 4% of GHG emissions (a part of N_2O and CH_4 emissions) also originate from fuel combustion. Methane emissions from coal mining and natural gas industry contribute by 5% of GHG emissions. The remaining 5% of the total GHG emissions consist of emissions from agricultural processes and waste disposal.

GHG emission scenarios

Review of existing scenarios and their basic assumptions (input data) such as economic indicators, energy prices and their possible future deregulation, opening energy markets, etc. was taken as a first step in the GHG emission scenario development. New economic scenarios have been formulated and GHGs emissions related to them re-estimated using the MARKAL model. Two realistic macroeconomic scenarios were developed - moderate and a high growth rate scenario - taking into account the EU accession process and further development of the EU policies and measures. The time horizon of the scenarios is given by the end of the first commitment period of the Kyoto Protocol (2008 - 2012).

Two *business as usual GHG emission scenarios* (thereinafter also *BAU*) which are a description of a plausible future in which no specific policy actions are taken to encourage actions that reduce GHG emissions or enhance carbon sinks. Only replacement of existing technologies after depletion of their lifetime is allowed by technologies available on the market. These scenarios differ by the general macroeconomic performance of the national economy. One scenario assumes the high economic growth rate (4.2% of annual GDP growth rate) while the other one assumes only moderate economic growth rate (2.5%). These two scenarios present the realistic range of possible economic development in the Czech Republic.

Three *mitigation scenarios* tight to individual two *BAU* scenarios (High and Moderate economic growth rate scenarios). The mitigation scenarios describe the future which is essentially similar to that one in the each baseline scenario with respect to overall economic and social trends, except that they assume policies or programmes are implemented that encourage adoption of measures that will reduce GHG emissions or enhance carbon sinks. The mitigation scenarios reflect different degrees of emission reductions relative to the base year to which reduction of GHG emissions is calculated in international treaties (1990). These mitigation scenarios are distinguished by reduction of GHG emissions as compared to *BAU* scenario in 2012 as follows:

- *Weak mitigation scenario* in which only a small reduction of GHG emissions by 5% is assumed.
- *Medium mitigation scenario* in which reduction of GHG emissions by 10% is assumed.
- *Strong mitigation scenario* in which reduction of GHG emissions by 15% is assumed.

Since in the Czech Republic the GHG emission scenarios are critically dependent upon expected operation of the Temelin Nuclear Power Plant (NPP), the *BAU* scenarios are elaborated in two alternatives – "with the Temelin NPP" and "without the Temelin NPP".

Sensitivity Analysis

The above BAU scenarios have been subjected to sensitivity analysis examining effects of major factors such as macroeconomic growth, energy prices, penetration of new technologies, use of nuclear energy and implementation of environmental and other policies declared by the Czech Government.

It has been found that CO_2 emissions are strongly dependent upon GDP annual growth. The higher economic growth the higher CO_2 emissions. CO_2 emissions in the *High BAU* scenario are by 16% higher than in the *Moderate BAU* scenario and by 23.5% higher than in the *Low BAU* scenario.

The probable impact of energy prices on CO_2 emissions has been studied in case of the *Moderate BAU* scenario, when a substantial difference in crude oil and natural gas prices in 2012 (34%) but limited changes of coal prices (7%) are assumed. The analysis shows a rather limited sensitivity of CO_2 emissions to world energy prices due to the impact of two antagonistic trends – gas-to-coal switching and energy savings. The difference between both cases is therefore only about 1%.

Nuclear energy plays an important role in the Czech power sector. Currently approx. 1/5 of power is produced in the Dukovany NPP. Another NPP at Temelin (South Bohemia) is in the final stage of construction. If both NPPs are operated on full capacity, they will provide approx. 50% of total inland power production. Both BAU scenarios are based on two following assumptions:

- The Dukovany NPP will be operated in full capacity up to 2012; and
- The Temelin NPP will start the operation in 2001 (first unit) and 2002 (second unit).

The impact of the Temelin NPP operation on the CO_2 emission level is quite significant. If this installation is not operated, the GHG emissions will be higher by 4.7% in 2004 as compared to the case with the Temelin NPP in operation and export of power surplus. If the power export is restricted and thus power production in coal fired plants is reduced, the estimated difference is even 6.5%.

The sensitivity of CO_2 emission reduction to implementation of the energy tax was also analysed. An implementation of the minimal energy tax rate proposed by the Commission of EU[37] on the level of 1.1 EUR/GJ for motor fuels and 0.7 EUR/GJ for other energy use is assumed. The resulting CO_2 emission reduction is about 0.6%. To increase the impact of the energy tax on CO_2 emission reduction even higher tax rate is recommended to be implemented in the Czech Republic.

Kyoto compliance

Emission projections obtained for BAU scenarios are compared (Figure 1) with previous ones published in the *Second National Communication* (2NC-BAU,1997) and in the *NSS* (NSS-High, 1997).

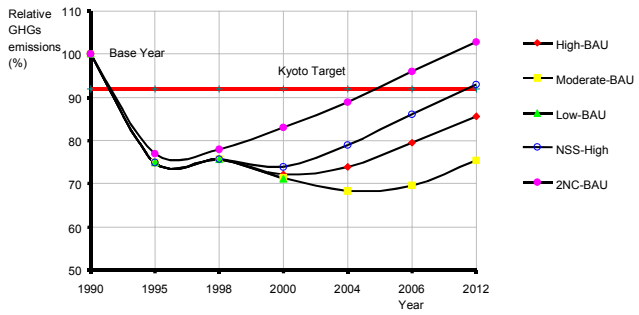

Figure 1: Emission projections for BAU (High, Moderate and Low) with previous projections

It is evident that the differences between compared projections are caused by a slowdown in economic performance (1997-1999) not predicted earlier. The GHG emission growth expected in the *High BAU* published in the *Phare study* is delayed in comparison with comparable projections published in the *Second National Communication* (1997). Improving energy efficiency of national economy indicates partial decoupling of GHGs emissions and GDP growth.

Under conditions of a stable and substantial economic growth (4-5% GDP growth annually), an approx. 2% annual growth rate of CO_2 emissions is expected to take place. The scenarios describing BAU (no specific policies and measures) therefore indicate need for more targeted approaches to be taken in the case of strong economic growth.

[37] Communication on Environmental Taxes and Charges in the Single Market, COM(97)9 final of 26.03.1997.

Marginal abatement costs (MACs)

The core issue of the project is the assessment of overall cost estimates of GHG emission reduction in the Czech Republic broken into relevant sectors and priority areas (policies and measures).

The focus of the work in the *Phare study* was in a large extent on priorities identified in the *Strategy* as follow:

- Production and distribution of heat and electric energy;
- Utilisation of renewable forms of energy;
- Support of railway combined modes of cargo transport;
- Municipal forms of urban transport;
- Energy savings in residential and government sector;
- Energy saving measures in SMEs;
- Collection and energy use of landfill methane, use of selected classes of waste as energy resource.

MACs for these areas as well as overall cross sector MACs that describes the abatement costs for GHG reduction in the CR has been calculated using the MARKAL model.

The MACs were calculated for the *High BAU* scenario (with the Temelin NPP) and the two following cases: with power export; and without power export..

Table 1 gives a review of the CO_2 emission reduction potential and MACs by the individually analysed sector as well as national data for the year 2012. The results show large differences in the CO_2 reduction potential among individual analysed sectors as well as a very wide range of MACs per unit of CO_2 emission reduction. The largest CO_2 emission reduction potential can be found in the sector "Production and distribution of power and heat".

This sector shows also a large potential in the category of CO_2 emission reduction with MACs up to 30 USD/t – 9.6 Mt/yr. The largest CO_2 emission potential in the category of MACs up to 30 USD/t was found in the residential sector - 16.6 Mt per year with the total reduction potential in this sector of 23 Mt per year[38]. Rather limited but low cost potential of GHG emission reduction can be found for energy use of landfill gas. Also switching from passenger car transport to public municipal transport is a very promising mitigation measure with MACs of 25 USD/t of CO_2.

The reduction potential of Czech forests will increase as generally poor health of forests improves; this may be enhanced by investment into proper management activities, e.g. liming, reforestation etc. Using forests as a reservoir for biomass would enhance use of forests as an energy resource. Potential of

[38] It is necessary to notice that manufacturing industry was not analysed in detail as a separate sector. Its reduction potential is expected to be substantial - probably larger than in the residential sector.

other renewables is either exhausted (large hydropower) or limited (solar, wind etc.). A relatively limited potential has been identified in the public sector (government buildings, hospitals, schools etc.) and in the waste sector because their GHG emission level is also limited. Nevertheless, abatement costs are quite attractive in these sectors for potential investors. Abatement policies and measures in the transport sector are generally limited and relatively expensive.

Table 1: CO_2 emission reduction potential and MACs by analysed sector and national data

Sector	Total CO_2 emission reduction potential	MACs	CO_2 emission reduction potential MACs up to 30 USD/t
	Mt/yr	USD/t	Mt/yr
Sectoral data			
Power and heat - with electricity export	27.7	316	9.6
Utilisation of renewables	8.6	518	7.1
Energy efficient transport	2.5	8,500	0.35
Promotion of public transport	0.45	750	0.35
Promotion of combined transport	0.1	4,022	0
Savings in residential sector	23	766	16.6
Savings in public services	2.35	568	1.5
Use of landfill gas	1.2	24	1.2
Waste-to-energy use	0.5	200	0
National data*)			
High BAU scenario with electricity export	65.2	3,105	26.6
High BAU scenario without electricity export	62.3	3,105	22.4
Moderate BAU scenario	58.4	70,650	9.6

Reduction potential of AIJ/JI and international/domestic emission trading

The so called national "trading potential" (JI or emission trading) has been estimated on the basis of emission projections and ongoing international debate on Kyoto Protocol "flexible mechanisms". We discuss our results taking into account the *Strategy*, so called "additionality" and other requirements for the AIJ/JI projects (emission baselines). Recommendations on the use of the Kyoto flexible mechanism potential have been discussed and options worked out.

It has been assumed that a national scheme of emission permit trading should be established for a number of industries in accordance with "Green Paper on greenhouse gas emission trading within the European Union" presented by the European Commission in March, 2000 and its background studies (CCAP and FIELD).

Perspectives for ET and JI in the Czech Republic

There is a potential for JI and/or ET since the GHG emissions of the Czech Republic is expected to remain well below the Kyoto target. Thus, future JI investors will face a limited risk of non-compliance of the Czech Republics Kyoto obligations. In respect to ET the theoretical potential for trading the units between the actual GHG emissions and the Kyoto target is in the range of 5 - 30 mil. tonnes of CO_{2eq}. In any case, to tap this potential would need establishing a *National system for the Kyoto Protocol* (see below) as required by Art. 5, KP.

The utilisation of the JI potential depends upon the ability of the Czech Republic to create an efficient system to administer JI projects. The present JI potential is also limited by the "additionality" requirement, e.g. expected implementation of IPPC Directive 96/61/EC eliminates large industrial installations where energy saving is laid down as a general obligation of the operator. ET is likely to become a more relevant mechanism for the EU candidate countries since the European Commission urges them to be prepared for use of this mechanism.

JI seems to be more complex and it is currently difficult to estimate baselines due the lack of consensus on baseline methodologies. There is also substantial uncertainty on the EU approximation deadlines. It is therefore impossible to judge at this moment whether JI can be considered relevant after several years. Moreover, JI supply will depend closely of the JI demand from investor countries and the incentives for investors seem limited[39].

Taking into account the reduction potential of above sectors assessed, differences of ET and JI as well as the effect of the EU accession process on additionality of JI projects, an overall applicability of JI and ET has been ranked roughly for various sectors/areas (see Table 2). Besides these factors, MACs, expected size and number of projects and possible complexity of baseline construction have been kept in mind. Similar small projects could be aggregated in packages using a standard baseline.

MACs and Market Prices

Today, no real prices are available concerning ET. Estimations published are based e.g. upon an introducing fictive carbon taxes on use of fossil fuels[40]. All estimates show a large variety of market prices[41], ranging from 10 to 60 USD/t of CO_{2eq} traded during the first commitment period. For the purpose of the *Phare study*, an average price of 10 USD/t of CO_{2eq} of ERU is supposed for the first commitment period (2008-2012).

[39] CarlBro a/s, "JI in the Baltic Region, Economic and Energy Political Perspectives", 2000.

[40] Zhang ZhongXiang, Estimating the Size Potential Market for the Kyoto Flexibility Mechanisms, University of Groninngen, 1999.

[41] U.S. DOE, Impacts of the Kyoto Protocol on U.S. Energy Markets and Economic Activity, Washington, 1998.

Table 2: Ranking of JI and ET applicability in various sectors

Sector	*JI*	*ET*
Residential Sector	♦	◊
Energy Sector	◊	♦
Industry[42]	◊	♦
Forest	◊	♦
Renewables	♦	◊
Public Sector	♦	◊
Waste Management	◊	♦
Transport	n.a.	n.a.

-

♦ *no restrictions caused by MACs or limited JI "additionality";*

◊ *- Applicability limited due to higher MACs, number, size, character or "additionality" of projects;*

n.a. - not applicable due to high MACs.

National System for the Kyoto Mechanisms

The term "national system" appears in KP, Art. 5, and refers to an overall system of GHG emission and sinks monitoring (national emission registries and inventories)[43]. This system should enable JI and "entity" participation in ET. National systems will therefore have the following functions:

- Monitor national Kyoto compliance;
- Establish links to international ET; and
- Support domestic trading related to entities and JI projects.

At domestic level, these functions may be identical with those needed for international trading since similar types of information will be required by both ET and JI regimes. The national system shall therefore act as a boundary for trading on one hand and as a safeguard for reaching national compliance on the other.

The ability to monitor GHG emissions with an accuracy required by IPCC standards is a main function of KP system of an Annex I Party. The Czech team carrying out national emission inventories in accordance with continuously improving IPCC methodologies should be the first building block of such a system. As in the case of other EU candidates, the implementation of the Community monitoring mechanism for CO_2 and other greenhouse gas emissions is an obligation for the Czech republic.

Fulfilment of the monitoring requirements of Kyoto Protocol for Fast Track

To be eligible to use the "!fast track" the Czech Republic (CR) have to fulfil a set of requirements. The current situation is as follows:

- CR has in place a monitoring system in accordance with Article 5.1 KP;
- The National registry is not yet in place;
- Have not yet established the initial assigned amount;
- CR have submitted 1st and 2nd annual GHG national inventory in accordance with provisions of Articles 5.2. and 7.1 KP.

The Czech Republic will fulfil the requirements but some very important monitoring requirements has not yet been fulfilled.

Flexible Mechanisms and EU Pre-accession Costs

The Czech Republic is a candidate for the EU membership transposing and implementing Community environmental legislation. This will require e.g. to grant IPPC permits for new large combustion plants based on the BAT and obligation to reduce energy intensity (see Article 3, Directive 96/61/EC).

It must be taken into account that accession costs to comply with Acquis are relatively high, e.g. 9.3 billion of EUR for the Czech Republic[44]. The most demanding directives from the investment point of view are those related to industry and the municipal sector, including Council Directive 96/61/EC concerning integrated pollution prevention and control (IPPC), Council Directive 88/609/EEC on limitation of emission of certain pollutants into the air from large combustion plants (LCP), amended by 94/609/EC, Council Directive 94/63/EC on the control of volatile organic compound (VOC) emissions resulting from the storage of petrol and its distribution from terminals to service stations, Council Directive 1999/13/EC on the limitation of emissions of VOCs due to the use of organic solvents in certain activities and installations, Council Directive 91/271/EEC concerning urban waste water treatment and Council Directive 1999/31/EC on the landfill of waste. A major part of GHG abatement costs is therefore hidden in EU accession costs.

It is obvious that the GHG trading potential of IPPC category installations have to be used to ease the burden related to introduction of BATs. The early establishing of a national KP system shall enhance interest of operators of IPPC category installations in the distribution of GHG emission ceilings over this group of ET entities.

[42] Without energy transformation processes (power and heat generation)

[43] Mullins F., National Systems for the Kyoto Mechanisms, Background paper, AIXG Workshop on Transition country perspectives and the Kyoto Protocol, Bratislava, 2000.

[44] Source: World Bank and TME (1999)

Achieving Effective Technology Transfer under the CDM and JI.

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Keywords. Technology transfer, cleaner technology, energy, environment, development.

Abstract. Technology transfer from developed countries to developing countries and transition economies is a key part of the Kyoto Protocol. Under the JI and CDM arrangements, it is envisaged that a range of cleaner low-carbon technologies will be acquired by companies in transition and developing economies. This paper takes a closer look at some international experiences of transferring cleaner technologies to China and other major developing countries and transition economies. It highlights some of the issues raised by these experiences, and draws lessons for governments and firms in countries wishing to host CDM and JI projects, particularly accession States to the European Union.

Introduction

One of the primary aims of the flexibility mechanisms under the Kyoto Protocol is to transfer cleaner technologies from developed countries to reduce greenhouse gas emissions in developing countries.

According to a recent report published by the Intergovernmental Panel on Climate Change (IPCC), 'the area in which the Kyoto Protocol itself may have the greatest implications for technology transfer is in its establishment of the project based mechanisms, Joint Implementation (JI) (Article 6) and the Clean Development Mechanism (CDM) (Article 12)' (IPCC 2000). The CDM is seen by the authors of the report as a particularly promising route for technology transfer to developing countries since it 'invites Annex I countries to work with developing countries to further sustainable development' (IPCC, 2000).

Whilst there is an increasing belief within developing countries and transition economies that the CDM and JI will help them acquire cleaner technologies, many uncertainties remain. A major uncertainty is that the detail of the Kyoto mechanisms are still subject to negotiation by national governments. Even when the detailed rules have been agreed, it is far from clear that effective technology transfer will be achieved. Past experience has shown that there are many common barriers to effective technology transfer from companies and other organisations in industrialised countries to their developing country counterparts.

The purpose of this paper is to highlight some of these barriers. The paper draws on the technology transfer literature, with illustrations from some recent technology transfer programmes to China and other major developing countries. It then draws lessons from these, and discusses some implications for the framing of the CDM and JI mechanisms, and the needs of accession States to the European Union.

What Does Technology Transfer Mean ?

The existing literature on technology transfer is extremely diverse, taking in various academic perspectives including economics, international relations and engineering. As a result, technology transfer has various meanings that depend on the context in which it is used. In general, technology transfer can be classified as vertical - from the research laboratory to commercial use - or horizontal - from one geographical area to another (Ping Lan 1996, Bozeman 2000). Recent uses of the term, including its application to developing and transition economies, have tended to fall within the latter category.

Comprehensive surveys of the technology transfer literature with a particular focus on cleaner technologies and development include those by Ping Lan (1996) and Martinot et al (1997). For the purposes of this paper, it is important to draw out some of the main insights from this literature to illuminate the empirical evidence that follows. These insights focus particularly on three related aspects of the transfer process - the motivations of technology suppliers, the influence of the technology transfer mechanism, and the capabilities of firms and organisations that acquire technology.

Many authors have identified the tendency of international technology transfer efforts to focus on capital goods and equipment. For example, an analysis by Peter Evans (1999a) focuses on international aid to the energy industries within China. His data confirms that the majority of this aid has funded the construction of new thermal and hydro-electric power plants.

In practice, this international emphasis on capital goods and equipment only captures one dimension of technology transfer. The recent report on technology transfer from the IPCC points out that the measurement of the financial aid flows which enable the export of this equipment provides a poor proxy for technology transfer in its broadest sense. As well as the export of new equipment, a broader definition encompasses '... the process of learning to understand, utilise and replicate the technology including the capacity to choose it and adapt it to local conditions and integrate it with indigenous technologies' (IPCC, 2000).

A particularly relevant characterisation of broader technology transfer is that developed by Martin Bell (see Figure 1). He has identified three main types of technology flow which pass between technology suppliers in 'industrialised' countries and importers in 'developing' countries. The first of these (flow 'A') consists of capital goods, equipment and product designs. In many definitions of technology transfer, this type of flow is dominant. However, as Bell has pointed out, two additional flows are also extremely important. The transfer of knowledge for operations and maintenance (flow 'B') requires the technology supplier to impart additional understanding which

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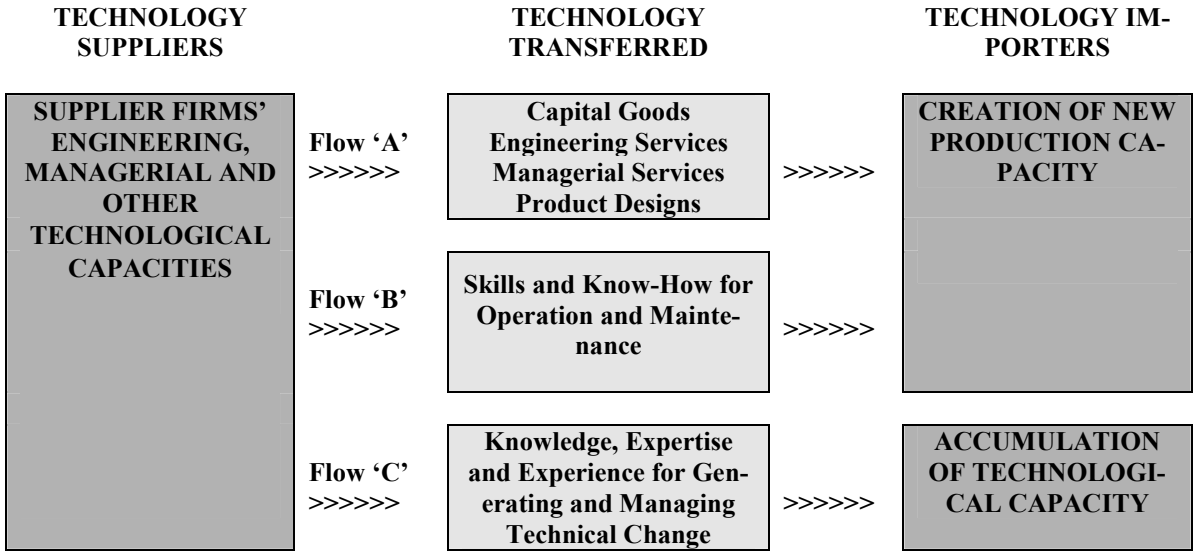
enables the importer to optimise the operation of the facility and to maintain it in the most cost effective way. This type of technology transfer is often carried out to some extent by technology suppliers, though the amount of attention devoted to it varies considerably.

Figure 1. Modes of Technology Transfer



Source: Bell, M. (1990) *Continuing Industrialisation, Climate Change and International Technology Transfer,* SPRU, University of Sussex, UK.

Perhaps the most important and potentially contentious type of technology transfer is the knowledge and expertise necessary for generating and managing technical change (flow 'C'). It implies the transfer of design skills and engineering knowledge necessary to recreate and optimise a particular item of equipment. As a result, this type of transfer can be more demanding on both parties, particularly with respect to human resources and skill levels. Whilst this additional transfer of knowledge is essential if firms within developing countries are to develop their own technological capabilities, this can directly conflict with the needs of a technology supplier to maintain their commercial and technological advantage.

Martin Bell's main point is that there is a need to transfer the underlying *knowledge* which lies behind the design and operation of a particular piece of hardware as well as the hardware itself. Without this underlying knowledge, the recipient firm or institution will not be able to operate equipment effectively or make the kind of incremental improvements which are common in developed countries.

Motivations of Technology Suppliers

The extent and success of individual technology transfer programmes is heavily influenced by the agendas of public and private institutions on the supply side. It has often been pointed out that the respective roles of these institutions are in conflict with each other. As Mammo Muchie observes, 'the international dialogue ... suggests that as a matter of responsibility and commitment to the environment, technology proprietors from countries with strong systems of innovation can be enjoined to transfer [technologies] on "favourable terms" to developing countries' (Muchie 2000).

OECD country Governments, which are the source of the majority of bilateral and multilateral aid flows to developing countries, negotiate environmental and technology transfer agreements for a variety of reasons. These include regional security, poverty alleviation and trade as well as environmental protection. Whilst there is often an alignment of interests between donor Governments and multinational companies, these companies will only transfer technology if it is in their commercial interest to do so. As a result, the effectiveness of State-led efforts to transfer cleaner technologies to developing countries is often limited.

The Japanese Green Aid Plan

The challenges of State-led technology transfer are clearly illustrated by the experience of the Japanese Green Aid Plan. The Green Aid Plan (GAP) is the largest environmental technology transfer programme to developing countries in Asia. When it designed and implemented the programme, the Japanese Government was motivated by a number of considerations including environmental protection, trade promotion and wider bilateral diplomatic relations (Evans 1999b).

Despite its successes in financing the installation of Japanese cleaner technologies in several Asian countries, the GAP has several drawbacks as a vehicle for technology transfer. One of the most important issues is dissemination. This is a key concern for both Japan and developing countries since there have been no follow-on orders for equipment supplied to the demonstration plants. Both sides agree that the main reason for this is the cost of the Japanese equipment that has

been used at the demonstration plants. It is simply too expensive for many companies in developing countries to buy on a commercial basis since any economic benefits (e.g. reduced energy consumption) are outweighed by high investment costs.

A second issue is more important than the cost of Japanese equipment. The GAP has a striking drawback as a vehicle for technology transfer. At present, equipment companies from developing countries who could build up a capability in the design and manufacture of cleaner technologies are almost completely absent from the GAP. The focus on *technology users* such as steel mills and cement companies means that equipment manufacturers are generally excluded from technology transfer activities. Officials within MITI and employees of Japanese companies give two very different kinds of response when asked about this exclusion. Either they claim that developing country companies are incapable of absorbing advanced Japanese technology, or they cite worries that Japanese designs will be copied by potential low-cost competitors.

Assistance to the Ukrainian Energy Sector

Another illustration of the influence of donor governments and international technology suppliers is provided by the Ukrainian Chernobyl replacement project. Multilateral efforts to help the Ukraine close the stricken Chernobyl nuclear power plant have been the subject of much controversy over the past few years.

Attention has focused on the decision of the G7 countries in 1995 to finance measures in the Ukrainian power sector to replace the capacity lost by Chernobyl's closure. From the outset, the G7's preference has been to fund the completion of two part-built VVER reactors, Khmelnitsky 2 and Rovno 4 (K2/R4).

In summer 1996, the European Bank for Reconstruction and Development (EBRD) commissioned an economic assessment of the K2/R4 financing plan. The Panel of Experts who carried out the assessment found that the plan did not constitute the best use of $1bn of EBRD and European Union funds. Instead, the Panel argued that the funds should be used for a number of initiatives, some of which would foster cleaner technology transfer to Ukrainian industry. These include the purchase of fuel and equipment spares for existing fossil-fuel power plants that suffer from poor performance, safety upgrades at existing nuclear plants and demand side assistance to the public and private sectors to help them reduce energy costs.

Despite considerable evidence that the completion of K2/R4 would not be the 'least cost' option for replacing Chernobyl, the EBRD gave the go-ahead for K2/R4 funding in December 2000 (EBRD 2000). According to the leader of the economic assessment Panel (Surrey 1997), this decision was expected because of the commercial interests of nuclear technology suppliers in the USA and Europe. It may also have been driven by the desire of NATO to split Ukraine from Russia to aid the process of expansion into Central Europe.

For some, the decision to go-ahead with K2/R4 reflects a missed opportunity for the transfer of cleaner energy technologies to the Ukraine. Rather than transferring 'Western' knowledge and skills to help the Ukraine modernise its power sector, it can be argued that the completion of K2/R4 will do the opposite: it will help Western European and US nuclear companies acquire new knowledge of Russian reactor designs. Furthermore, the project will not facilitate improvements in environmental performance within the Ukrainian power sector and other energy-intensive industries. However, it remains to be seen what the final outcome of the project will be.

Technology Transfer Mechanisms

There are a variety of different mechanisms for technology transfer. A recent report to the IPCC identifies nine separate 'pathways' for technology transfer including 'government assistance programmes, direct purchases, licensing, foreign direct investment, joint ventures, co-operative research agreements and coproduction agreements, education and training, and government direct investment' (IPCC 2000). Each of these has strengths and weaknesses for both parties to the transaction, and the choice of the appropriate mechanism is heavily influenced by the motivations of these parties as well as the technology being transferred.

As stated earlier, it is much more likely that the transfer process will be a success if the mechanism allows for more than the simple transfer of hardware equipment. According to some authors, developing countries have suffered in the past because this important factor was not taken into account. Xiaofeng Gong's observations about the case of China are a good illustration of this: 'Unfortunately China's technology imports have fallen into the following cycle: importation, temporary narrowing of the technology gap, stagnation in efforts to adapt and upgrade imports, outdating of technology leading again to importation' (Xiaofeng Gong 1995).

The technology transfer literature demonstrates that there is considerable debate about which technology transfer mechanism is the most effective. Many studies have highlighted the increasing trend towards the establishment of joint venture companies within developing countries (Warhurst and Bridge 1997). Joint ventures can be one of the most effective technology transfer mechanisms since they bring both sides into close working contact, and give them a direct stake in the future success of the product or service concerned. By contrast, other mechanisms such as licensing agreements do not involve as much direct contact.

Despite their appeal, joint ventures have not been universally popular amongst foreign investors. In China for example, international companies are showing a preference for wholly owned due to a perceived need for more management control (Xiao Zhang 2000). It is probable that such subsidiaries will provide fewer opportunities for technology transfer to Chinese firms.

The Capabilities of Firms and Organisations that Acquire Technology

As we have seen, the development of capabilities in the design and manufacture of new technologies by recipient companies is a key component of successful technology transfer process.

It has often been pointed out that recipient firms usually have some pre-existing knowledge of the technology in question. In some cases, the extent of this knowledge is highly significant. This is particularly true of firms in transition economies in Eastern Europe and former Soviet republics. Technology transfer between these firms and collaborators in 'Western' countries is often a two way process. There is a large literature showing evidence of *East to West* technology transfer in a range of different economic sectors (for example Dyker, 1999).

For cleaner technologies concerned with the reduction of greenhouse gas emissions, the picture is rather different. Cleaner technology is one area in which two way transfer between 'Western' countries and transition economies is less common. According to Michael Barz, '[West to East] technology transfer is … required if [Multinational Companies] are to maintain internal and international environmental standards' (Dyker 1999: 120). As is the case in developing countries, capabilities in cleaner technologies amongst firms in transition economies are relatively weak.

Because of this difference in capabilities, it is important to take into account the level of knowledge and skills within the recipient country and/or firm. As Martinot et al (1997) have observed, the 'notion that technology can be transferred full-blown from one economic and cultural context to another' is now widely discredited. Therefore, there is a clear need to adapt technology to the host country, largely by involving domestic institutions and companies. In addition, the host country national innovation system – comprising firms, universities and research institutions – needs to be strengthened so that it can more effectively receive and assimilate new technologies from abroad (IPCC 2000).

One project that has addressed many of these issues is the Guizhou and Shanxi Energy Efficiency project funded by the UK and Chinese governments. It focused on low cost energy efficiency improvements at ten industrial sites in China (Minchener 1999). Since this project was funded by a UK government Department concerned with development rather than trade, it has been explicitly shaped by the needs of Chinese technology importers and users.

The additional equipment installed at the case study sites to reduce emissions was sourced from both the UK and China. In general, Chinese equipment was used whenever possible, especially if this had been recently developed. Hardware from the UK was only used when it was clear that this would perform significantly better than Chinese hardware. For example, UK firms supplied steam and water meters since it was essential that these should be accurate in order to assess plant performance.

The capital costs of the work at the case study sites varied from $6,000 to $68,000. The financial savings from implementation gave rise to payback periods ranging from 1 month (for a $21,000 investment at a cement mill that saved 325 tonnes of CO_2 per year) to 40 months (for a $68,000 investment at a beer factory that saved 1070 tonnes of CO_2 per year). As these examples suggest, significant reductions in emissions of carbon dioxide, sulphur dioxide and dust were achieved in most cases.

Implications for CDM and JI Projects

The analysis in this paper has shown some of the problems that can arise when governments and companies in OECD countries set out to transfer new technologies to their counterparts in the developing world. At present, it is still unclear how future international agreements, including the Kyoto flexibility mechanisms, will minimise the impact of these problems. Whilst the CDM and JI will lever finance for introduction of cleaner energy technologies, effective technology transfer is not assured.

Liu Xue of Beijing University has summed up one of the major issues from the perspective of China: 'Under the CDM framework presently discussed, it can be assumed that technologies China can acquire through the CDM are mainly mitigation equipment and technologies for maintaining and operating such equipment rather than technologies necessary to manufacture mitigation equipment' (Liu Xue, 2000).

Michael Barz has drawn a similar conclusion from a study of technology transfer to Russian firms. He observes that the 'know-why' necessary to assimilate new technology and improve it 'has not been systematically incorporated into technology transfer to Russian firms' (Dyker 1999: 122).

These statements illustrate a crucial point. Whilst it is clear that some technology transfer will accompany CDM and JI projects, there is no guarantee that companies within recipient countries will acquire new capabilities in the design and manufacture of cleaner technologies. As this paper has shown, the transfer of the wider technical knowledge necessary to generate and manage cleaner innovation is often problematic for international technology suppliers. This is either because it can compromise the commercial advantage of international firms or because it depends on relatively intangible 'tacit' knowledge. Despite these difficulties, many firms and governments see both technological knowledge and hardware transfer as essential components of their work with their counterparts in developing and transition economies.

These conclusions suggest some lessons for governments and companies within developing and transition economies that will take part in projects under the CDM and JI. The following lessons may be particularly important for accession States to the EU:

- The transfer of technological knowledge or 'know why' is as important as investment in new hardware. Without the former, the recipient firm or institution may not gain sufficient insight in cleaner technologies to apply them effectively.
- Host and donor governments should not prescribe JI and CDM projects in too much detail. It is important to remember that international firms (not governments) usually develop and apply cleaner technologies. Firms have their own commercial agendas and therefore need room for manoeuvre in their negotiations with recipient companies.

- Incremental technologies can provide a low cost route to reduced greenhouse gas emissions and improved capabilities in the developing world. There is a strong case for helping transition economies and developing countries to 'leapfrog' their Western counterparts and use the best available technology. However, technology transfer programmes must build on existing capabilities and industrial structures within recipient countries.
- Preferred technology lists and generic baselines for the calculation of emissions reductions under the CDM or JI can be counter-productive. If they are too rigidly applied, many low cost CO_2 abatement opportunities may be inadvertently disqualified. However, it is also important to recognise that increased flexibility and project-specific appraisal may lead to high transaction costs.

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Programme

Thursday February 8, 2001	
8:45 of	**Opening:** Prof. Andrzej Korbel, Deputy Rector UMM
9:00	**European energy RTD socio-economy** Domenico Rossetti di Valdalbero, DG Research, European Commission
9:15	**Main results of The Hague** Regina Betz, FhG-ISI
Session 1: Project based Kyoto Mechanisms (Chair: Prof. Adam Gula, UMM/FEWE)	
9:45	**Experiences with the AIJ pilot phase** Lenka Kovarova, Czech Environment Ministry
10:30	**How to integrate CDM and JI in national policies: The Dutch ERUPT-programme** Remko Ybema, ECN
11:15	**Break**
11:30	**Risk Management of Investments in Joint Implementation Projects** Josef Janssen, University St. Gallen, IWOe
12:15	**Participation of DCs in climate change prevention: CDM and beyond** Denise Cavard IEPE/CNRS
13:00	**Lunch**
Session 2: A Framework for Emissions Trading (Chair: Dr. Rainer Walz, FhG-ISI)	
14:30	**Joint Implementation versus Emissions Trading: Differences and Similarities** Paul Koutstaal, Dutch Ministry of Finance
15:15	**The Green Paper of the European Commission: A framework for trading at European level? Ongoing research activities** Matthieu Wemaere, DG Environment, EC
16:00	**Break**
16:15	**Integrating Emission Trading into national policy: The Danish trading scheme** Eva Jensen, DEA
17:15	**Integrating Emission Trading into national policy: The UK trading scheme** Margret Mogford, UK Emissions Trading Group Secretariat
18:00	**Discussion:** Common design and national differences: How will existing national schemes be compatible with a European trading scheme?
20:00	**Dinner**

Friday February 9, 2001	
Session 3: A Perspective for EU Enlargement (Chair: Prof. Àlvaro Martins, CEEETA)	
8:45	**Status of the implementation of the "Acquis Communautaires"** Ewa Anzorge, Polish Ministry of Foreign Affairs
9:30	**The feasibility of domestic CO_2 emissions trading in Poland** Fanny Missfeldt, Risoe
10:15	**Integrating Accession Countries in the European trading scheme** Grzegorz Konopko, NFOSiGW
11:00	**Break**
11:15	**Experiences with the National Strategy Study for the Czech Republic** Miroslav Maly, SRC International CS
12:00	**Achieving Effective Technology Transfer under the CDM and JI** Jim Watson, SPRU
12:45	**Lunch**
14:15	**Round table discussion:** How to integrate Accession Countries in the European Bubble or European trading scheme
15:30	**Presentation of main conclusions** Rapporteurs to Sessions 1-3

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